

WINTER
EDITION

CITIZENS

50¢

Radio Call Book Magazine

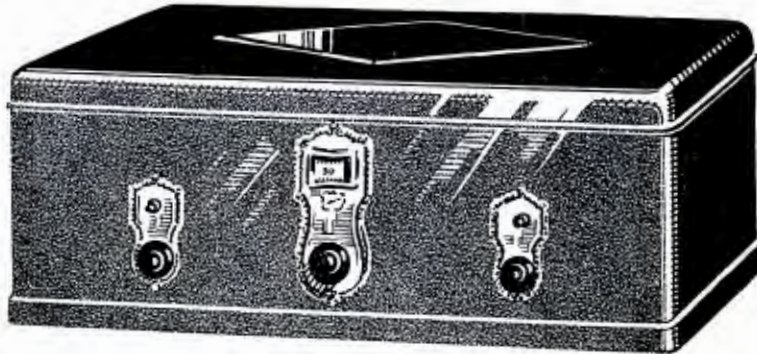
and Scientific Digest

November
1928



RADIO - TELEVISION - MECHANICS

HOWARD RADIO



THE 1929 HOWARD
Green Diamond Eight
All Electric 8-Tube Receiver

This—the latest addition to the HOWARD line—is the result of a determined effort by HOWARD Engineers to produce a radio receiver of exceptional quality at a reasonable price. One of the outstanding features is the absence of an external power unit. Everything but the speaker is built in the chassis.

\$125

HOWARD quality, so well known throughout the radio field, has not been sacrificed in the design and construction of this new receiver. Now ready for inspection at leading dealers.

Other HOWARD Models to \$2500. Send for illustrated booklet and name of nearest HOWARD representative.

Howard Radio Company

Makers of Fine Radio Receivers—Exclusively

CHICAGO

Licensed by R.C.A. and Associated Companies

W.C. BRAUN COMPANY

WHOLESALE RADIO HEADQUARTERS

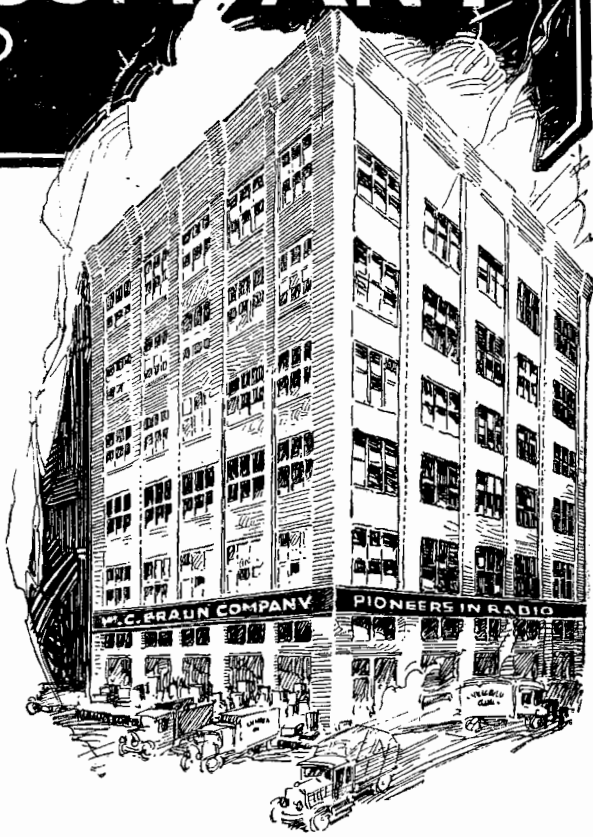
Radio Is Booming

THIS is the peak year in radio. Business is booming. The public realizes that AC sets and tubes are here, and perfected. Those who are now in the radio business are thriving because they're giving the public what it wants—real entertainment at a low cost.

Whether you are a dealer selling complete factory-built radio sets or a professional set-builder building custom-built radio, W. C. Braun Company, Wholesale Radio Headquarters, offers you the choicest products of the world's leading manufacturers at prices that will appeal to the public and create more sales and profits for you.

See Our Permanent Radio Show

In our commodious display rooms we conduct a permanent radio show for the benefit of visiting dealers. Here are on display and for demonstration purposes the latest designs in radio sets, fine radio furniture, latest speakers and built-up models of the leading custom-built circuits. You are invited to come in and inspect this merchandise, to try it out, to convince yourself that it is what you can recommend and sell to your trade.



The World's Largest Mail Order Radio Store

Here, under one roof, is carried the world's largest stock of radio sets, circuits, furniture, speakers, accessories and parts. Besides a complete radio line, we have a full line of auto supplies, tires and tubes, electrical supplies, camp fixtures, wiring material, sporting goods, holiday merchandise; in fact, the very things that help you to do a profitable all-year-round business. Mail orders are given special attention, our same-day service meeting the requirements of dealers the country over.

Have You the Big Braun Radio Catalog?

Braun's Dealers' Buyers' Guide and Catalog shows 264 pages crammed full with bargains. This catalog is sent free to dealers. If you haven't received your copy, be sure to write for it now.



W. C. Braun Company

Pioneers in Radio

596-B W. Randolph St.



Distributors of These Nationally Known Radio Lines

All-American	Balkite	Hammarlund-
Aero	Micamold	Roberts
Jewel	Baldwin	Steinitz
Amsco	Thordarson	De Jur
Pacont	Trim	Jones
Bremer-Tully	Excello	Magnavox
Silver-Marshall	Samson	Jensen
Raytheon	Carter	Temple
Browning-Drake	Polymat	Farrand
Kingston	Pilot	R. F. I.
Belden	Matheson	Potter
Cockaday	Cardwell	Peerless
Lynch	McCullough	Newcomb-
Bosch	Aalco	Hawley
Scott	Burgess	Superior
Pioneer	Bodino	Lund
Hammarlund	Ramler	Pierson
Karas	Hoyt	Showers
Daven	Acme	Amplion
Valley	Continental	Pathe
Benjamin	Allen-Bradley	Aerovox
Jefferson	Victoreen	Parvot
Amertran	Signal	Amperite
General	Ultradyne	Arcturus
Sangamo	Stevens	Cornish
Dubilier	Madison-Moore	Utah
Eveready	Precise	United-Roberts
Sterling	Eagle	Hyatt
Standard	National	Dongan
Bruno	H. F. L.	Coco
Sonatron	Eby	Abcox
Magnaformer	Tyrman	Elkon
Cunningham	X-L	Racon
R. O. A. Tubes	Cutler-Hammer	Readrite
Monroe Sets	Frost	B. M. S.
Elkay	Durham	Cardwell
Kurz-Kasch	Yaxley	R. E. L.
Trav-Ler	Mutor	Ward-Leonard
Centralab	Consrad	Electrad
Marco	Na-Ald	Goodell-Pratt
Kodel		And Many Others

Now-Make Your Radio Clear as a Bell~ with Marvelous New GROUND AERIAL!



Sub-Aerial Endorsed by Users

Aug. 31, 1928.

"I received my Underground Aerial all O. K. It has any aerial beat I have ever seen. I have used every aerial on the market since I have been a radio fan. The first day I installed it I got distant stations that my set had never touched before. It wasn't good radio weather either. I got stations in the East that I had never dreamed of getting and with absolute clearness and without static or interference. I heartily recommend your instrument to any lover of good radio reception."
A. N. Whitaua,
Box 565, El Reno, Okla.

Get Amazing Distance, Greater Volume and Finer Selectivity without Distortion

WHY go on listening to terrible static and other maddening outside noises? Now you can get the real music your present Radio is capable of giving, by hooking your set on to the clear, practically static free ground waves with Sub-Aerial. The air is always full of static and your overhead-aerial picks it up and brings it to your speaker. So why stay in the air—when you can use the whole earth as a static and noise filter with Sub-Aerial?

SUB-AERIAL is a scientific, proven system of taking the radio waves from the ground, where they are filtered practically free of static. It brings these filtered waves to your radio set clear of static and interference common with overhead aerials. The result is positively clear reception, remarkable selectivity and greatly increased volume. The overhead aerial is a thing of the past because it is the weak link in radio. SUB-AERIAL has replaced overhead aerials because SUB-AERIAL is 100% efficient. How can you get good reception without one?

Low Original Cost—No Upkeep Cost

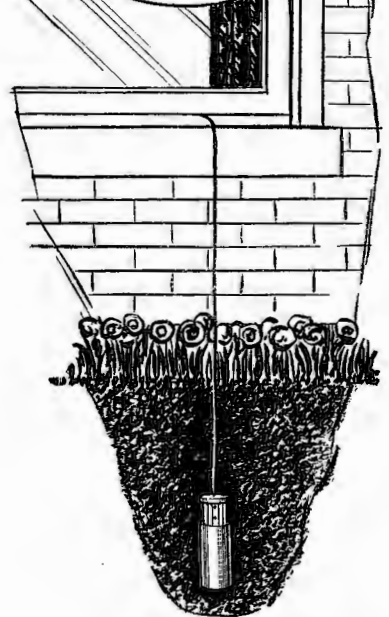
SUB-AERIAL costs no more than an overhead or loop aerial and less than many. Its first cost is the only one. SUB-AERIAL is permanent. No trouble—no hard work, or risking your neck on roofs.

25-Year Guarantee

SUB-AERIAL is guaranteed against any defects in workmanship or material and against deterioration for 25 years. Any SUB-AERIAL which has been installed according to directions and proves defective or deteriorates within 25 years, will be replaced free of charge; and also we will pay \$1.00 for installing any such new replacement.

TRY IT FREE!

We know so well the surprising results you'll get that we'll let you put in a Sub-Aerial entirely at our Risk. You be the judge. Don't take down your overhead Aerial. Pick a night when static and noise interference on your old Aerial are "Just Terrible." If Sub-Aerial doesn't Sell Itself to You Right Then on Performance—you needn't pay us a cent. Send for "all the Dope on Sub-Aerial." You'll be surprised. Do it NOW.



Can Be Installed in a Few Minutes

UNDERGROUND AERIAL SYSTEMS

St. Clair Bldg., Dept. 502-P.S.

Cor. St. Clair & Erie Sts.

Chicago, Ill.

Ground Out Static with SUB-AERIAL

Underground Aerial Systems,
Dept. 502-P.S. St. Clair Bldg.,
Cor. St. Clair & Erie Sts., Chicago, Ill.

Send me complete information on Sub-Aerial, Proof and Free Trial Offer. No obligation.

Name.....
Address.....
City..... State.....

DESIGNED TO RENDER UTMOST IN SERVICE

FROST-RADIO

PRICED TO GIVE YOU UTMOST IN VALUE

A Complete Line That Was Built for Your Specific Requirements

FROST-RADIO offers you the finest and most complete line of radio parts available. This great line was designed and built with the specific requirements of the set builder in mind. Consequently, when you go to your dealer and order these parts you are sure of obtaining the very finest on the market, built by engineers with many years of experience in radio parts manufacture. Obviously, your receiver will give better, finer and much more dependable results when you use these superior parts made by Frost-Radio.



FROST VOLUME CONTROL

Gives complete, stepless and wonderfully smooth control of volume and oscillation. Wearproof roller contact arm, Bakelite case and dust cover. \$2.00 and \$2.25.



FROST VOLUME CONTROL WITH A.C. SWITCH

We equip our famous Volume Control with approved A.C. Snap Switch tested to carry 250 volts at 3 amperes, so that both switch and volume control may be handled by single knob. \$2.75 and \$3.00.



FROST GEM VOLUME CONTROL

Identical with our standard size Volume Control units except in size. Gem units are only 1 1/2 in. in diameter and 5/8 in. thick. Great space savers. \$2.25 and \$2.50.



FROST VOLUME CONTROL WITH D.C. SWITCH

Equipped with sturdy German silver switch mounted on Bakelite panel and with switch points fitted with sterling silver contacts, this Volume Control gives quick operation, positive locking off position and saves space. For battery operated sets. \$2.35.



FROST GEM RHEOSTATS

Made to deliver a service that is not usually expected from little rheostats like these. Mighty good little rheostats, taking up little space and supplied either plain or with D.C. switch. Easy to solder to. Plain. 75c. With switch, \$1.00.



FROST BAKELITE-LITE RHEOSTATS

Long the standard air cooled Bakelite Rheostat, as well as the original of this type. Resistance wire is wound on die cut Bakelite strip over moulded Bakelite frame. Wide choice of resistances. \$1.00 to \$2.50.



FROST BAKELITE RHEOSTATS WITH D.C. SWITCH

Cleverly mounted German silver D.C. battery switch is firmly attached to Bakelite panel on back of rheostat, affording quick on and off control of filament current. 2 to 75 ohms. \$1.35.

FROST HUM BALANCER



Simply turn the slotted head shaft with screw driver to regulate. Smooths the ripple out of A.C. current. Precision built. \$1.00.



FROST CONVENIENCE OUTLETS

Fit std. outlet box. Brush brass or Bakelite plates. \$1.00 to \$3.25.



FROST MOULDED MICA CONDENSERS

Cannot be affected by moisture or climate. Moulded Bakelite with finest mica dielectric. Easy to attach. 45c to 90c.



FROST APPROVED A.C. SWITCH

Single hole mount 110 volt A. C. Snap Switch. Tested to 250 volts, 3 amps. Underwriters' approved. 75c.



FROST ALL-BAKELITE CABLE PLUG

Terminals cannot work loose even when overheated. Color code moulded into Bakelite. Best quality cable, with colored rubber insulation on wires. Has 5 ft. seven strand braid covered cable. Plug and cord only, \$2.25. Baseboard or sub-panel socket, 75c.



FROST PUSH-BACK HOOKUP WIRE

Slide back the braid for soldering, then slip braid back over soldered joint. No. 18 double cotton covered, impregnated wire, tinned. 50 ft. roll, 80c.



FROST HEAVY DUTY FILTER CONDENSERS

We use only finest quality linen paper and highest grade foils in building these Filter Condensers. Conservative ratings. Designed to give longest service with entire freedom from trouble. .5 to 2 mfd. \$1.40 to \$7.00.



FROST BY-PASS CONDENSERS

Made from finest materials, thoroughly seasoned, vacuum impregnated and hermetically sealed. Accurate capacities and conservative voltage ratings. .1 to 2 mfd. 80c to \$2.00.



FROST FIXED RESISTANCES

Die cut flexible Bakelite strip holds windings firmly in place. Terminals are staked into Bakelite. Also as center tapped resistances. 15c to 50c.

FROST BLOCKING CONDENSERS

Every particle of material used is of tested quality. Entire condenser enclosed in hermetically sealed cases after vacuum impregnation. Gold bronze lacquer finish; tinned terminals. \$18.00.



HERBERT H. FROST, INC.

Main Office and Factory, ELKHART, IND.
New York City CHICAGO San Francisco

HERE'S A BOOK THAT YOU SHOULD SEND FOR TODAY

It costs but little—10c brings it to your door—and contains a vast amount of valuable information about rheostats, volume controls, switches, jacks, plugs, condensers, circuits, etc. It's a book every fan should have. Fill out and mail coupon today for your copy.



HERBERT H. FROST, Inc.
160 North La Salle Street, Chicago

CRB-11

Send me your new Frost Data Book, containing valuable radio information and facts about your complete line of parts. I enclose 10c.

City.....State.....

My Name.....

Street Address.....

(Are you a professional set builder?.....)



The Lid Ripped Off "Back-Door" Selling in Custom-built Radio

We Start a Firm Foundation For This Business!



E. H. SCOTT

The radio industry has grown up "over night." Changes in the art and readjustments in dis-

tribution methods have been swift and revolutionary. What was accepted practice yesterday is taboo today.

First we had the era of the "home-built" receiver. The fan bought his parts where he could find them and put them together as best he could. Then, out of the ranks of these fans came a distinct new type of business man—the Professional Custom radio set-builder, men who made all or a large part of their living from building and selling radio sets.

About the time the professional custom set-builder was getting a footing in the radio field, the quantity production factory-built receiver came into the market. Large capital was attracted and great factories sprung up for the manufacture of radio receivers. Huge advertising appropriations and elaborate nation-wide selling campaigns were put behind them.

Unhealthy Practices Spring Up!

Radio sets were produced by the hundreds of thousands and the custom set-builder now had to compete with the factory built sets. Not only this but at the same time a complete new set of selling tactics sprung up in the distribution of radio parts.

Millions of net price catalogs were suddenly sent broadcast to the public by some of the so-called "Jobbers."

The situation has gradually gotten worse and at the present time anyone can walk into a very large number of the "Jobbers" and buy all the parts they want at "dealer's" prices. List prices have become a joke.

Not only this, but an examination of the principal mail order catalogs will show that the larger part of the space in them is this year given to the display of their own private brand completed set with the NET or discounted price prominently displayed. You can reach no other conclusion, therefore, that a large number of "jobbers" are gradually switching their efforts to the establishment of a market for their own particular private brand factory constructed receivers. With this policy we have no quarrel, everyone has a perfect right to conduct their business as they see fit. But our business lies in developing the custom set-builder, and there is no doubt at all but that the custom set-builder will be a non-existent party before long, if he is compelled to compete against the factory built set, sold to anyone who wants to buy one at WHOLESALE price. Think it over. *What chance has the custom set-builder of building up a permanent business with merchandise, either kits or completed sets, that his customers can buy at the same price as he can?*

In what other business have we the same conditions that now prevail in the radio parts business. What commodity can the general public buy at the same price the dealer pays for it? If you want to buy furniture, an automobile or a suit of clothes, you go into a retail store and pay list price for it, if you are not a dealer. As far as I know, the radio parts business is the only business of any size in the country in which the general public can buy merchandise at the same price as the dealer.

The Future—and the Custom Set-Builder

During the last three years we have developed what we consider the finest custom-built radio receiver on the market. We have a nation-wide organization of professional set-builders to construct and sell our receivers. A number of these men are now earning their living exclusively in this way and we see in them the future of both our own and the business of custom-built radio receivers.

We have, until recently, gone along the conventional trade channels, selling our products to the jobbers who, in turn, distributed them to the professional set-builder and local dealer. As has been the custom for several years, we allowed our receivers to be listed in the catalogs of the jobbers. Since these were principally list price catalogs with their circulation supposed to be restricted to established dealers and professional set-builders, this was a perfectly legitimate move. Even today there still are hundreds of legitimate jobbers who issue only list price catalogs and jealously guard their circulation. With this kind of jobber we have no quarrel and will continue to distribute our products through him.

But, during the past year or eighteen months there seems to have been a veritable epidemic of net-price "jobber" catalogs which have been indiscriminately circulated to the public. While the professional set-builder came through the frontdoor, the net price catalogs entered the back door. The business of the professional set-builder was threatened. All his work is going for naught when his customers can buy at the same discounts at which he has to purchase. His biggest source of income is about cut off and his work reduced to a matter of "Service" and "Installation"—steps that

THE LID RIPPED OFF "BACK-DOOR" SELLING OF CUSTOM-BUILT SETS

would not allow him sufficient return for his efforts.

We Take Drastic Steps to Protect the Professional Set-Builder

Our own organization of set-builders were quick to warn us of the danger of this situation. Therefore, we have taken a drastic step to protect them. We have cut the so-called net-price-catalog-jobber, who distributes his catalogs indiscriminately, entirely out of our distribution system. Hereafter no "Scott" receiver will be listed in any net price catalog. Nor, if we can help it, will they be sold over the counter by any so-called "Jobber" who makes a practice of selling to the public at dealers' discounts. The entire wholesale trade has been so advised and just as soon as all present issues of net-price catalogs listing our line have run their course, our contact with jobbers who sell to the general public at discount prices is ended forever. Only set-builders and dealers will be able to purchase at discounted or net-prices.

A Comprehensive Plan of Support

We believe in custom-built radio. The finest things are always hand-made and there are millions of homes that will have nothing but the best and are quite willing to pay for it.

Our first job has been to produce a receiver that will satisfy this demand. Our second problem was to build up a nation-wide staff of "Scott" builders to construct and sell these fine receivers. We now have hundreds of such men in every state in the Union and in some foreign countries. These are men qualified by skill and business ability to do a creditable job of distributing "Scott" receivers to the public.

In organizing and co-operating with this staff of "Scott" dealers or builders, our efforts have not stopped in providing a good product and fair competitive marketing conditions. We back up our builders with a complete, elaborate selling campaign. We have a beautiful, hard-hitting series of folders on which we will imprint the set-builder's or dealer's name. An extensive advertising campaign is conducted to further popularize and push the sale of "Scott" receivers. A sales manual and daily correspondence, contests,

etc., form a background of real support to authorized "Scott" builders. Never before, to our knowledge, has any kit manufacturer gone so far in the support of his retail outlets.

Let's Put This Business on a Firm Footing!

We call on all forward-looking professional set-builders and all other manufacturers in this field to support this movement to protect the custom-built radio retail market. If we are to make of this a substantial, lasting business, it must find its foundation on time-tried, common sense, proven policies; *protecting the legitimate established set-builders, or the man who wants to get into this business.* He must be able to go to his customer with full faith that he can demand and get fair retail prices. In no other way can he be assured of a living margin of profit.

We know what we are talking about in this situation. We know it from contact with our own builders. We have worked with them in handling our products. We know what they face. We also know that our own self-interests are best served by making it possible for them to make a healthy, liberal profit for themselves and to build up a permanent, prosperous business.

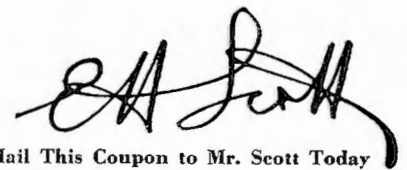
Make an Easy Start with the Most Popular Custom-Built Receiver!

We believe the new SCOTT WORLD'S RECORD SHIELD GRID NINE is the most popular and powerful custom-built radio receiver ever placed on the market. Shortly after its introduction, we were swamped with orders for it. During the last four years we have brought out three different models and we are extremely proud of the fact that not one of these has been a "lemon." Every model has always been a receiver that would perform and a big success. Within the last three months we have been forced to more than double our laboratory floor space and to treble our staff of workers. Only within the past few weeks have we been able to catch up with and keep apace of the sensational demand for this new receiver. It has everything you can ask for, wonderful tone, hair-

line selectivity, with tremendous volume. Herein lies an opportunity for the progressive professional set-builder. With such a receiver and such a sales policy as we have outlined, his success is assured. We are constantly adding to the Scott sales organization and we invite sincere, able, hardworking set-builders everywhere to join us in establishing for themselves lasting, secure businesses in this great field.

How to Sell Custom-Built Radio

We will, within the next few days, have off the press a new sales manual entitled "How to Sell Good Custom-Built Radio." It contains the composite experience of hundreds of successful professional set-builders. It is a liberal education in the art of selling this wonderful product—custom-built radio. It will save many an hour and make many a dollar of profit for set-builders everywhere. A copy will be sent free to any professional set-builder and to anyone who contemplates getting into this field. Write, giving us an idea of your experience as a set-builder, stating the number of sets you have built and sold. Second, write us fully, telling just what you think of this idea of protecting the retail market for the professional set-builder and making such suggestions as you wish along the line of placing this business of custom-built radio on a firm foundation. Just fill out the coupon below and attach to your letter, and the book will be sent to you as soon as it is off the press.



Mail This Coupon to Mr. Scott Today

E. H. SCOTT		C B 11
Scott Transformer Company		
4448 Ravenswood Ave.		
Chicago, Illinois		
Enclosed is my letter expressing my ideas about your plan of protecting the retail market for the Professional Radio Set-builders. I am a professional myself, as shown in my letter. Please send me a free copy of your sales manual, "How to Sell Good Custom-Built Radios."		
Name.....		
Address.....		
City.....		State.....

---Do not fail to see Page 145---

Citizens Radio Call Book Magazine

AND SCIENTIFIC DIGEST

C. O. STIMPSON, President
E. H. JAUDON, Vice-President
D. H. BELL, Secretary-Treasurer
H. ANHEISER, Assistant Treasurer

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NOVEMBER, 1928

Vol. 9, No. 4

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In This Issue

TELEVISION is unquestionably taking the world, at least the experimental one, by storm, as is indicated by the great amount of interest which experimenters are manifesting in this new and absorbing art. The department of this issue devoted to television contains a wealth of practical material, which will be helpful to any who are attempting to secure vision by radio. Our laboratory is still following closely the Jenkins transmission from Washington and will report from issue to issue upon the progress being made with this transmitter, as well as any other which may come into public prominence.

Another interesting department has been started in this issue of our magazine for the benefit of the novice, either juvenile or adult. It is known as "The ABC of Radio." In addition to giving useful information in simple language for the novice, it will also act as the official organ for the Junior Radio Guild, a national organization of boys studying the elementary side of radio with a view to later taking their places in the radio research, production, construction or sales fields, all depending upon their ambition. In fact, this department is a stepping stone for those who wish to eventually become professional set builders, for which latter class we already have a well established and extensive department in the magazine.

The list of broadcast stations in this issue is undoubtedly the latest available, since it incorporates every change made by the Federal Radio Commission up to the time of going to press, and we have been given quite definite assurance that few, if any changes, will be made in this list. Therefore, you may safely feel that you have the most up-to-the-minute list available in printed form.

The Editor.

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New York—(Branch Office)—35 W. 33rd St. Longacre 1063.

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THEY'RE THERE
IN THE
WORLD'S
FINEST RECEIVERS

STANDING guard at the door of tone, Thordarson audio and power transformers do their part in making real musical instruments of hundreds of thousands of radio receivers annually.

Leading receiver manufacturers are well aware of the important relationship between the choice of transformers and the musical characteristics of their instruments. No wonder, then, that the majority of manufacturers of quality radio receivers have turned to Thordarson as the logical transformer source.

When buying your receiver, insist on Thordarson amplification and power supply. The set manufacturer who uses Thordarson transformers can be depended upon to have the balance of his receiver in keeping with this high standard of performance.

Custom set builders will find Thordarson transformers to meet every radio need at their nearest parts dealer.

THORDARSON
RADIO
TRANSFORMERS

SUPREME IN MUSICAL PERFORMANCE

8585

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

American Broadcasting Stations

Station assignments shown in the following pages are effective November 11th, the new allocations having been made by the Federal Radio Commission. This list is revised from issue to issue in accordance with such reallocations as the Commission may make.



Initials such as E, C, M, and P denote Eastern, Central, Mountain and Pacific time. No wavelength is given in this list, but frequency is stated, which is the new method of designation recommended by the Federal Radio Commission.



KDKA

980 kc, East Pittsburgh, Pa., Westinghouse E. & M. Co., 50,000 w, E.

KDLR

1210 kc, Devils Lake, N. D., Radio Electric Co., 100 w.

KDYL

1290 kc, Salt Lake City, Utah, Intermountain Broadcasting Corp., 1000 w, M, "On the Air, Goes Everywhere. Shared.

KEGF

1300 kc, Los Angeles, Calif., Trinity Methodist Church, 100 w, P. Shared.

KEJK

1250 kc, Beverly Hills, Calif., R. C. MacMillan, 500 w, P. Shared.

KELW

780 kc, Burbank, Calif., Earl L. White, 500 w, P, "The White Spot of the San Fernando Valley." Shared.

KEX

1180 kc, Portland, Ore., Western Broadcasting Co., 2500 w, P, "A Public Service Necessity." Shared.

KFAB

770 kc, Lincoln, Neb., Nebraska Buick Automobile Co., 5000 w, C, "Home, Sweet Home." Shared.

KFAD

620 kc, Phoenix, Ariz., Electric Equipment Co., 500 w, M, "Phoenix, Where Winter Never Comes."

KFAU

1250 kc, Boise, Idaho, Independent School Dist., 4000 w daytime, night 1000 w, P.

KFBB

1360 kc, Havre, Mont., F. A. Britney Co., 50 w, M.

KFBK

1310 kc, Sacramento, Calif., Kimball-Upson Co., 100 w, P.

KFBL

1500 kc, Everett, Wash., Leese Bros., 50w, P, "The Voice of Puget Sound." Shared.

KFBU

600 kc, Laramie, Wyo., Bishop N. S. Thomas, 500 w, M, "The Top of the World."

KFCB

1310 kc, Phoenix, Ariz., Nielsen Radio Supply Co., 100 w, M, "Kind Friends Come Back."

KFCR

1500 kc, Santa Barbara, Calif., Santa Barbara Broadcasting Co., 100 w, P.

KFDM

560 kc, Beaumont, Tex., Magnolia Petroleum Co., 1000 w, C, "Kall for Dependable Magnolene" Shared.

KFDX

1210 kc, Shreveport, La., First Baptist Church, 50 w, C. Shared.

KFDY

550 kc, Brookings, S. D., State College, 500 w, C. Shared.

KFEC

1370 kc, Portland, Ore., Meier & Frank Co., 50 w, P, "Known for Every Courtesy." Shared.

KFEL

940 kc, Denver, Col., Eugene P. O'Fallon, Inc., 250 w, M, "The Argonaut Station." Shared.

KFEQ

560 kc, St. Joseph, Mo., Scroggin & Co., 500 w, C. Shared.

KFEY

1210 kc, Kellogg, Idaho, Union High School, 10 w, P, "The Voice of the Coeur d'Alenes."

KFGQ

1310 kc, Boone, Iowa, Boone Biblical College, 10 w, C.

KFH

1300 kc, Wichita, Kan., Hotel Lassen, 500 w, C, "Kansas' Finest Hotel, in the Very Heart of God's Country." Shared.

KFHA

1200 kc, Gunnison, Colo., Western St. College of Colorado, 50 w.

KFI

640 kc, Los Angeles, Calif., Earl C. Anthony, Inc., 5000 w, P, "National Institution."

KFIF

1420 kc, Portland, Ore., Benson Polytechnic School, 50 w, P.

KFIO

1230 kc, Spokane, Wash., North Central High School, 100 w day, P.

KFIU

1310 kc, Juneau, Alaska, Alaska Electric Light & Power Co., 10 w, "A Voice From the Far North."

KFIZ

14200 kc, Fond du Lac, Wisc., Fond du Lac Commonwealth Reporter, 100 w, C.

KFJB

1200 kc, Marshalltown, Iowa, Marshall Electric Co., 100 w, C, "Marshalltown, the Heart of Iowa."

KFJF

1470 kc, Oklahoma City, Okla., National Radio Mfg. Co., 5000 w, C, "Radio Headquarters of Oklahoma. Shared.

KFJI

1370 kc, Astoria, Ore., Geo. Kincaid, 50 w, P. Shared.

KFJM

550 kc, Grand Forks, N. D., University of North Dakota, 500 w, C. Shared.

KFJR

1300 kc, Portland, Ore., Ashley C. Dixon & Son, 500 w, P. Shared.

KFJY

1310 kc, Ft. Dodge, Iowa, C. S. Tunwal, 100 w, C. Shared.

KFJZ

1370 kc, Ft. Worth, Texas, Henry Clay Allison, 100 w, C.

KFKA

880 kc, Greeley, Colo., Colora State Teachers College, 500 w, M. Shared.

KFKB

1130 kc, Milford, Kan., Dr. J. R. Brinkley, 5000 w, C, "The Sunshine Station in the Heart of the Nation."

KFKU

1220 kc, Lawrence, Kan., University of Kansas, 1000 w, C, "Up at Lawrence on the Kaw." Shared.

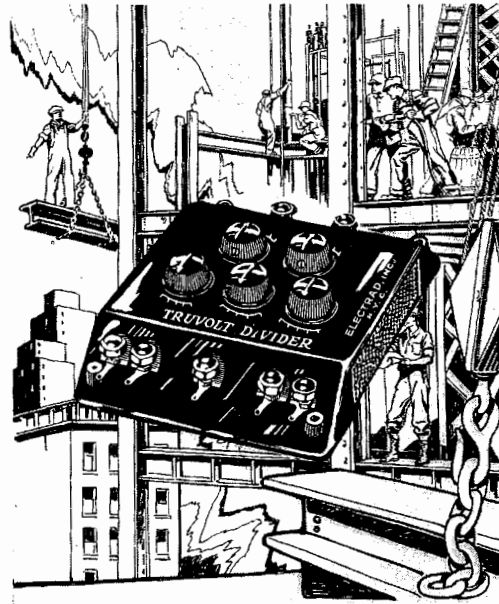
KFKZ

1200 kc, Kirksville, Mo., Northeast Missouri State Teachers College, 50 w, C, "Kirksville, the Home of Osteopathy."

KFLV

1410 kc, Rockford, Ill., Swedish Evan. Mission Church, 500 w, C.

For Building
a Power
Supply of
Universal
Application



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This device removes the guesswork and saves time and trouble in constructing an eliminator. By dividing the filter voltage into usable values, it eliminates the necessity of mathematical calculations. It does away with a great deal of wiring and the need of regulator tubes.

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calibrate the adjustable contacts. By the use of tables or graphs, the Divider may be adjusted to give the desired voltages without the use of a high resistance voltmeter.

Case made of genuine bakelite. Can be mounted on baseboard or sub-panel, or used as the front panel of a metal cabinet, at the same time providing binding posts for all B and C Voltages. Price \$12.50. Electrad specializes in a full line of Controls for all Radio Purposes, including Television.

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ELECTRAD, INC., Dept. EA-11, 175 Varick St., New York, N. Y.

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Royalty Variable Resistor _____ Truvolt Divider
"Electrad Control Manual" (Enclose 10c. for mailing)
"What is Eliminator Shall I Build?" (Enclose 10c.)
I am particularly interested in _____
Name _____ Address _____

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Inc

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

KFLX

1290 kc, Galveston, Texas, Geo. Roy Clough, 100 w, C.

KFMX

1250 kc, Northfield, Minn., Carleton College, 1000 w, C. Shared.

KFNF

890 kc, Shenandoah, Iowa, Henry Field Seed Co., 500 w, C, "Known for Neighborly Folks." Shared.

KFOA

1270 kc, Seattle, Wash., Rhodes Department Store, 1000 w, P. Shared.

KFON

1250 kc, Long Beach, Calif., Nichols & Warriner, Inc., 1000 w, P, "Where Your Ship Comes In." Shared.

KFOR

1210 kc, Lincoln, Neb., Howard A. Shuman, 100 w, C.

KFPL

1310 kc, Dublin, Texas, C. C. Baxter, 15 w, C, "Baxter's Place."

KFPM

1310 kc, Greenville, Texas, The New Furniture Co., 15 w, C, "Biggest Little Ten Watts on the Air."

KFPW

1340 kc, Cartersville, Mo., Rev. Lannie W. Stewart, 50 w.

KFPY

1390 kc, Spokane, Wash., Symons Investment Co., 500 w, P.

KFQB

1240 kc, Ft. Worth, Texas, W. B. Fishburn, Inc., 1000 w, C. Shared.

KFQD

1230 kc, Anchorage, Alaska, Anchorage Radio Club, 100 w. Shared.

KFQU

1420 kc, Holy City, Calif., W. E. Riker, 100 w, P. Shared.

KFQW

1420 kc, Seattle, Wash., KFQW, Inc., 100 w, P, "Gateway to Alaska and the Orient." Shared.

KFQZ

850 kc, Hollywood, Calif., Taft Radio & Broadcasting Co., Inc., 250 w, P.

KFRC

610 kc, San Francisco, Calif., Don Lee, Inc., 1000 w, P.

KFRU

630 kc, Columbia, Mo., Stephens College, 500 w, C, "Where Friendliness is Broadcast Daily." Shared.

KFSD

600 kc, San Diego, Calif., Airfan Radio Corp., 500 w, P.

KFSG

1120 kc, Los Angeles, Calif., Echo Park Evan. Assn., 500 w, P, "The Church of the Air."

KFUL

1290 kc, Galveston, Texas, Thomas Goggin & Bros., 500 w, C, "The City of Perpetual Sunshine."

KFUM

1270 kc, Colorado Springs, Colo., W. D. Corley, 1000 w, M, "Known for Unsurpassed Mountain Scenery." Shared.

KFUO

550 kc, Clayton, Mo., Concordia Theological Seminary, 500 w, C, "The Gospel Voice." Shared.

KFUP

1500 kc, Denver, Colo., Fitzsimmons General Hospital, 100 w, M.

KFUR

1370 kc, Ogden, Utah, Peery Building Co., 50 w, M.

KFVD

700 kc, Culver City, Calif., W. J. McWhinnie, 250 w, P.

KFVS

1210 kc, Cape Girardeau, Mo., Hirsch Battery & Radio Co., 50 w, C, "The City of Opportunity." Shared.

KFWB

950 kc, Los Angeles, Calif., Warner Bros. Broadcasting, 1000 w, P. Shared.

KFWC

1200 kc, Ontario, Calif., Lawrence E. Wall, 100 w, P, "The Voice of the Orange Empire." Shared.

KFWF

1200 kc, St. Louis, Mo., St. Louis Truth Center, Inc., 250 w. Shared.

KFWI

930 kc, San Francisco, Calif., Radio Entertainments, Inc., 500 w, P. Shared.

KFWM

930 kc, Oakland, Calif., Oakland Educational Society, 500 w, P, "The Most Good to the Most People." Shared.

KFWO

1500 kc, Avalon, Calif., Lawrence Mott, 100 w, P, "Catalina for Wonderful Outings." Shared.

KFXD

1420 kc, Jerome, Idaho, Service Radio Co., 15 w, M.

KFXF

940 kc, Denver, Colo., Pikes Peak Broadcasting Co., 250 w, M, "The Voice of Denver." Shared.

KFXJ

1500 kc, Edgewater, Colo., R. G. Howell, 50 w, M, "America's Scenic Center." Shared.

KFXR

1310 kc, Oklahoma City, Okla., Exchange Avenue Baptist Church, 50 w, C.

KFXY

1420 kc, Flagstaff, Ariz., Mary M. Costigan, 100 w, M.

KFYO

1500 kc, Breckenridge, Texas, Kirksey Bros. Battery & Elec. Co., 100 w, C, "Breckenridge, the Dynamo of West Texas."

KFYR

550 kc, Bismarck, N. D., Hoskins-Meyer, 500 w, C. Shared.

KGA

1470 kc, Spokane, Wash., Northwest Radio Service Co., 5000 w, P.

KGAR

1370 kc, Tucson, Ariz., Citizen's Publishing Co., 100 w, M, "Way Out on the Desert."

KGB

1360 kc, San Diego, Calif., Dr. Arthur W. Yale, 250 w, P, "Music For the Sick."

KGBU

900 kc, Ketchikan, Alaska, Alaska Radio & Service Co., 500 w. Shared.

KGBX

1370 kc, St. Joseph, Mo., Foster-Hall Tire Co., 100 w.

KGBZ

930 kc, York, Neb., Federal Live Stock Remedy Co., 500 w, C, "The Swine and Poultry Station." Shared.

KGCA

1270 kc, Decorah, Iowa, Chas. W. Greenley, 50 w, daytime. Shared.

KGCC

1210 kc, Oklahoma City, Okla., Wallace Radio Inst., 50 w, C.

KGCI

1370 kc, San Antonio, Texas, Liberto Radio Sales, 100 w, C, "Radio Sam at San Antonio."

KGCN

1420 kc, Concordia, Kan., Concordia Broadcasting Co., 50 w.

KGCR

1210 kc, Brookings, S. D., Cutler's Radio Broadcasting Service, Inc., 100 w.

KGCU

1200 kc, Mandan, N. D., Mandan Radio Association, 100 w, M, "The Voice of the West."

KGCX

1420 kc, Vida, Mont., First State Bank of Vida, 10 w, M.

KGDA

1370 kc, Dell Rapids, S. D., Home Auto Co., 15 w.

KGDE

1200 kc, Barrett, Minn., Jaren Drug Co., 50 w, C.

KGDM

1150 kc, Stockton, Calif., E. F. Pepper, 10 w.

KGDP

1210 kc, Pueblo, Colo., Boy Scouts of America, 10 w, M.

KGDR

1500 kc, San Antonio, Texas, Joe B. McChane, 100 w, C.

KGDY

1200 kc, Oldham, S. Dak., J. Albert Loesch, 15 w, C.

Which of these Famous CeCo Tubes will you choose?

A GENERAL PURPOSE type of tube for detector radio frequency or audio amplifier uses. Built in every type and variety to meet all ordinary set needs with the flawlessly beautiful reproduction only CeCo affords.

POWER AMPLIFIERS. A group of seven marvelous amplifying tubes which afford as great or as little volume as you desire. For loads from 3 volts to 450. Priced from \$2.50 to \$12.00.

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HALF-WAVE RECTIFIERS for handling plate voltages up to 750, delivering a direct current of 110 millamps with minimum voltage drop.

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SPECIAL HIGH MU TUBES for resistance and impedance coupled audio amplifiers or in all audio frequency sockets.

SPECIAL R.F. TUBES for higher voltage amplification to build up weak signals without distortion.

SCREEN GRID TUBES, R.F. or A.F. Amplifier for use in special circuits. The high voltage amplification assures excellent results on DX.

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CECO A.C. AMPLIFIERS for unusually excellent results on the radio frequency or audio stages\$2.50

CECO A.C. "HIGH MU" AMPLIFIER for use in resistance or impedance coupled amplifiers on A.C.; affords marked increase in volume without distortion.....\$4.00

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IF you haven't tried the CeCo Power Tubes, you cannot realize the tremendous difference they offer—not only in the clear tone quality of their performance, but in their amazing ruggedness and long life.

CeCo Type J71, a 5 volt ½ amp. power tube, handles the largest loud speaker easily at the peak of its full volume. At 90 volts it affords 12 times the undistorted volume of the ordinary "A" type tube.

Higher evacuation, a new OXIDE filament and many other refinements of design and manufacture leave these CeCo Power Tubes with no equal in the field today.

Almost every good dealer can provide you with CeCo Tubes. If not, write direct for the address of your nearest dealer.

CeCo MANUFACTURING CO., Inc.
702 EDDY STREET, PROVIDENCE, R.I.

KGEK

1200 kc, Yuma, Colo., Beehler Elec. Equip. Co., 50 w, M. Shared.

KGEN

1200 kc, El Centro, Calif., Irey & Bowles, 15 w, P.

KGER

1370 kc, Long Beach, Calif., C. Merwin Dobyns, 100 w, P, "The Service Club of the Air."

KGEW

1200 kc, Ft. Morgan, Colo., City of Ft. Morgan, 100 w, P. Shared.

KGEZ

1310 kc, Kalispell, Mont., Flathead Broadcasting Association, 100 w, M, "Located in the Switzerland of America—The Beautiful Flathead Valley."

KGFF

1420 kc, Alva, Okla., Earl E. Hampshire, 25 w, C.

KGFG

1370 kc, Oklahoma City, Okla., Full Gospel Church, 50 w, C, "The Whole Gospel to the Whole World."

KGFH

1000 kc, La Crescenta, Calif., Frederick Robinson, 250 w, P.

KGFI

1310 kc, San Angelo, Texas, San Angelo Broadcasting Co., 15 w, C, "The Voice of West Texas."

KGfJ

1420 kc, Los Angeles, Calif., Ben S. McGlashan, 100 w, P, "Keeps Good Folks Joyful."

KGfK

1200 kc, Hallock, Minn., Kittson County Enterprise, 50 w, C.

KGfL

1370 kc, Raton, N. Mex., N. L. Cotter, 50 w, M.

KGfW

1420 kc, Ravenna, Neb., Otto F. Sotlman, 50 w.

KGfX

580 kc, Pierre, S. D., Dana McNeil, 200 w daytime, C.

KGgF

1010 kc, Picher, Okla., D. L. Connell, M.D., 500 w, Shared.

KGgH

1310 kc, Cedar Grove, La., Bates Radio & Electric Co., 50 w, C.

KGgM

1370 kc, Albuquerque, N. Mex., Jay Peters, 100 w.

KGHA

1200 kc, Pueblo, Colo., Geo. H. Sweeney, 50 w, M.

KGHB

1320 kc, Honolulu, Hawaii, Radio Sales, 250 w.

KGHD

1420 kc, Missoula, Mont., Elmore-Nash Broadcasting Co., 5 w, M.

KGHF

1320 kc, Pueblo, Colo., Ritchie & Finch, 250 w, M.

KGHG

1310 kc, McGehee, Ark., Chas. W. McCollum, 50 w.

KGHI

1500 kc, Little Rock, Ark., Berean Bible Class, 15 w.

KGHL

950 kc, Billings, Mont., Northwestern Auto Supply Co., 250 w, M.

KGHX

1500 kc, Richmond, Tex., Ft. Bend City School Board, 50 w, C.

KGJF

890 kc, Little Rock, Ark., First Church of the Nazarene, 250 w.

KGKB

1500 kc, Goldthwaite, Tex., Eagle Publ. Co., 100 w, C.

KGKL

1370 kc, Georgetown, Tex., M. L. Cates, 100 w, C.

KGO

790 kc, Oakland, Calif., General Electric Co., 10,000 w, P.

KGRC

1310 kc, San Antonio, Texas, Gene Roth & Co., 100 w, C.

KGRS

1410 kc, Amarillo, Texas, Gish Radio Service, 1000 w, C. Shared.

KGTT

1420 kc, San Francisco, Calif., Glad Tidings Temple, 50 w, P, "Voice of Glad Tidings." Shared.

KGU

940 kc, Honolulu, Hawaii, Marion Multrony, 500 w, "In the Land of Sunshine, the Future Playground of America."

KGW

620 kc, Portland, Ore., Oregonian Pub. Co., 1000 w, P, "Keep Growing Wiser."

KGy

1440 kc, Lacey, Wash., St. Martins College, 50 w, P, "Out Where the Cedars Meet the Sea." Shared.

KHJ

900 kc, Los Angeles, Calif., Don Lee, Inc., 1000 w, P, "Kindness. Happiness. Joy."

KHQ

590 kc, Spokane, Wash., Louis Wasmer, Inc., 1000 w, P, "In the Friendly City."

KICK

1420 kc, Atlantic, Iowa, Atlantic Automobile Co., 100 w daytime. Shared.

KJBS

1100 kc, San Francisco, Calif., Julius Brunton & Sons Co., 100 w, P, "The Voice of the Storage Battery." Shared.

KJR

970 kc, Seattle, Wash., Northwest Radio Service Co., 5000 w, P.

KKP

1420 kc, Seattle, Wash., City of Seattle, 15 w, P. Shared.

KLcN

1290 kc, Blytheville, Ark., Daily Courier-News, 50 w, C.

KLDS

950 kc, Independence, Mo., Midland Broadcasting Co., 1000 w, C, "The Station Dedicated to Knowledge, Liberty, Divinity and Service." Shared.

KLRA

1390 kc, Little Rock, Ark., Arkansas Broadcasting Co., 1000 w. Shared.

KLs

1440 kc, Oakland, Calif., Warner Bros., 100 w, P, "The City of Golden Opportunity." Shared.

KLX

880 kc, Oakland, Calif., Tribune Pub. Co., 500 w, P, "Where Rail and Water Meet." Shared.

KLZ

560 kc, Dupont, Colo., Reynolds Radio Co., Inc., 1000 w, M, "The Pioneer Station of the West."

KMA

930 kc, Shenandoah, Iowa, May Seed & Nursery Co., 500 w, C, "Keeps Millions Advised." Shared.

KMED

1420 kc, Medford, Ore., W. J. Virgin, 50 w, P, "See Crater Lake."

KMIC

1120 kc, Inglewood, Calif., James R. Fouch, 250 w, P.

KMJ

1200 kc, Fresno, Calif., The Fresno Bee, 50 w, P.

KMMJ

740 kc, Clay Center, Neb., The M. M. Johnson Co., 100 w daytime, C, "The Old Trusty Station."

KMO

1340 kc, Tacoma, Wash., KMO, Inc., 500 w, P. Shared.

KMOX

1090 kc, Kirkwood, Mo., Voice of St. Louis, Inc., 5000 w, C.

KMTR

570 kc, Los Angeles, Calif., KMTR Radio Corp., 1000 w, P, "Your Friend in Hollywood." Shared.

KNRC

780 kc, Santa Monica, Calif., Pickwick Broadcasting Corp., 500 w, P, "The Station with a Smile." Shared.

KNX

1050 kc, Hollywood, Calif., Western Broadcast Co., 5000 w, P, "The Voice of Hollywood."

KOA

830 kc, Denver, Colo., General Electric Co., 12,500 w, M.

KOAC

560 kc, Corvallis, Ore., Oregon State Agricultural College, 1000 w, P, "Science for Service." Shared.

**164
PAGES
of RADIO
VALUES**

A NEW CATALOG JUST OFF THE PRESS

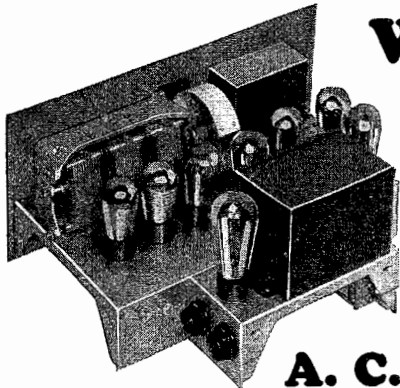


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KOB

1180 kc, State College, N. M., N. M. College of Agri. & Mech. Arts, 5000 w, M, "The Sunshine State of America." Shared.

KOCW

1420 kc, Chickasha, Okla., Oklahoma College for Women, 100 w, C.

KOIL

1260 kc, Council Bluffs, Iowa, Mona Motor Oil Co., 1000 w, C, "The Hilltop Studio."

KOIN

940 kc, Portland, Ore., KOIN, Inc., 1000 w, P, "The Station of the Hour."

KOMO

920 kc, Seattle, Wash., Fisher's Blend Station, Inc., 1000 w, P.

KORE

1420 kc, Eugene, Ore., Eugene Broadcast Station, 1000 w, P.

KOW

1390 kc, Denver, Colo., Associated Industries, Inc., 500 w, M, "The KOW Station Away Out West." Shared.

KPCB

1210 kc, Seattle, Wash., Pacific Coast Biscuit Co., 100 w, P. Shared.

KPJM

1500 kc, Prescott, Ariz., Frank Wilburn, 15 w, M.

KPLA

570 kc, Los Angeles, Calif., Pacific Development Radio Co., 1000 w, P. Shared.

KPO

680 kc, San Francisco, Calif., Hales Bros. & The Chronicle, 5000 w, P, "The City of the Golden Gate."

KPOF

880 kc, Denver, Colo., Pillar of Fire, Inc., 500 w, M. Shared.

KPPC

1200 kc, Pasadena, Calif., Pasadena Presbyterian Church, 50 w, P. Shared.

KPQ

1210 kc, Seattle, Wash., Archie Taft & Louis Wasmer, 100 w, P.

KPRC

920 kc, Houston, Texas, Houston Printing Co., 1000 w, C, "Kotton Port Rail Center." Shared.

KPSN

950 kc, Pasadena, Calif., Pasadena Star-News, 1000 w, P. Shared.

KQV

1380 kc, Pittsburgh, Pa., Doubleday-Hill Elec. Co., 500 w, E, "The Smoky City Station." Shared.

KQW

1010 kc, San Jose, Calif., First Baptist Church, 500 w, P, "For God and Country."

KRE

1370 kc, Berkeley, Calif., First Congregational Church, 100 w, P. Shared.

KRGV

1260 kc, Harlingen, Texas, Harlingen Music Co., 500 w. Shared.

KRLD

1040 kc, Dallas, Texas, KRLD, Inc., 10,000 w, C, "Down Where the Blue Bonnets Grow." Shared.

KRMD

1310 kc, Shreveport, La., Robert M. Dean, 50 w, shared, C.

KRSC

1120 kc, Seattle, Wash., Radio Sales Corp., 50 w daytime, P.

KSAC

580 kc, Manhattan, Kan., Kansas State Agricultural College, 500 w, C. Shared.

KSBA

1450 kc, Shreveport, La., W. G. Patterson, 1000 w, C, "Keep Shreveport Before America."

KSCJ

1330 kc, Sioux City, Iowa, Perkins Bros. Co., 1000 w, C. Shared.

KSD

550 kc, St. Louis, Mo., Pulitzer Pub. Co., 500 w, C. Shared.

KSEI

900 kc, Pocatello, Idaho, KSEI Broadcasting Assn., 250 w, M, "Kummuny Southeast Idaho."

KSL

1130 kc, Salt Lake City, Utah, Radio Service Corp., 5000 w, M, "The Voice of the Intermountain Empire."

KSMR

1200 kc, Santa Maria, Calif., Santa Maria Valley R. R. Co., 100 w, P, "The Valley of Gardens."

KSO

1380 kc, Clarinda, Iowa, Berry Seed Co., 1000 w, C, "Keep Serving Others."

KSOO

1110 kc, Sioux Falls, S. D., Sioux Falls Broadcasting Assn., 1000 w daytime, C.

KSTP

1460 kc, Westcott, Minn., National Battery Broadcasting Co., 10,000 w, C.

KTAB

1280 kc, Oakland, Calif., Associated Broadcasters, 500 w, P, "Knowledge, Truth and Beauty." Shared.

KTAP

1210 kc, San Antonio, Texas, Robert B. Bridge, 100 w, C, "The World's Biggest Little Station."

KTBI

1300 kc, Los Angeles, Calif., Bible Institute of Los Angeles, 1000 w, P. Shared.

KTBR

1300 kc, Portland, Ore., M. E. Brown, 500 w, P. Shared.

KTHS

800 kc, Hot Springs, Ark., Arlington Hotel Co., 1000 w, C, "Kum to Hot Springs." Shared.

KTNT

1170 kc, Muscatine, Iowa, Norman Baker, 5000 w, C, "The Voice of the Iowa Farmers' Union." Shared.

KTSA

1290 kc, San Antonio, Texas, Alamo Broadcast Co., 1000 w, C.

KTUE

1370 kc, Houston, Texas, Uhalt Electric, 5 w, C

KTW

1270 kc, Seattle, Wash., First Presbyterian Church, 1000 w, P. Shared.

KUJ

1500 kc, Longview, Wash., Puget Sound Radio Broadcasting Co., 10 w, P. Shared.

KUOA

1390 kc, Fayetteville, Ark., University of Arkansas, 500 w, C. Shared.

KUOM

570 kc, Missoula, Mont., State University of Montana, 500 w, M.

KUSD

890 kc, Vermillion, S. Dak., University of South Dakota, 500 w, C. Shared.

KUT

1120 kc, Austin, Texas, University of Texas, 500 w, C, "Come to University of Texas." Shared.

KVI

1340 kc, Tacoma, Wash., Puget Sound Radio Broadcasting Co., 1000 w, P, "Puget Sound Station." Shared.

KVL

1500 kc, Seattle, Wash., Arthur C. Dailey, 100 w. Shared.

KVOO

1140 kc, Bristow, Okla., Southwestern Sales Corp., 1000 w, C, "The Voice of Oklahoma." Shared.

KVOS

570 kc, Bellingham, Wash., L. Kessler, 250 w, M. Shared.

KWBS

1500 kc, Portland, Ore., Schaeffer Radio Co., 15 w, P.

KWCR

1310 kc, Cedar Rapids, Iowa, Harry F. Paar, 100 w. Shared.

KWEA

1210 kc, Shreveport, La., William E. Antony, 100 w, C. Shared.

KWG

1200 kc, Stockton, Calif., Portable Wireless Tel. Co., 100 w, P. Shared.

KWJJ

1060 kc, Portland, Ore., Wilbur Jerman, 50 w, F "The Voice from Broadway."

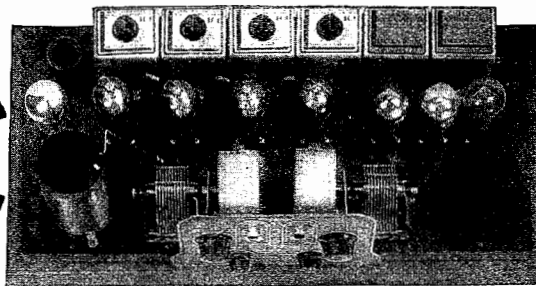
KWK

1350 kc, St. Louis, Mo., Greater St. Louis Broadcasting Corp., 1000 w, C. Shared.

THE LINCOLN 8-80 ONE-SPOT-SUPER ASTOUNDS THE RADIO WORLD

**4 SCREEN
GRID
TUBES**

**ONE
SPOT**



**TUNABLE
I.F. STAGES**

**NEW
AUDIO**

AN ENGINEERING TRIUMPH

*10 K. C. Selectivity
No Oscillation*

*Tremendous Volume
No Objectionable Harmonics*

A SUPER WITH MARVELOUS TONE QUALITY

CAN you imagine perfect reception on hot summer nights of stations 2000 miles away and 400 miles in daylight using a 10 ft. antenna in a steel and concrete bank building in the heart of Chicago? This is consistent performance for the Lincoln 8-80.

Just another super? **DECIDEDLY NOT!** The Lincoln 8-80 is not even similar to any super heretofore offered. We challenge the whole world of radio engineers to point out any one receiver incorporating the many advantages and new principles unique to the 8-80. IT IS NEW and different from the antenna to the tip jacks, —a new screen-grid first-detector, a radically different three stage screen-grid intermediate frequency amplifier and a revolutionary audio system. Yet it is remarkably simple, more beautiful and goes together easier than any other set you've ever seen. It stands alone, a radically new triumph of engineering based on sound, common sense.

The remarkable new Lincoln screen-grid intermediate frequency amplifier is the secret of the astonishing performance of the 8-80. Gone are the well-meant but clumsy methods of the past,—complicated shielding, "laboratory matched" transformers that are never matched when the set is finished, matched sets of tubes, and all of the heretofore "necessary evils" from which you tried in vain to obtain real reception.

You can peak the Lincoln Intermediates in 20 seconds when your set is in operation, correcting for all trouble you have had in the past. Every Lincoln 8-80 you build will perform alike.

CLOUGH AUDIO SYSTEM

Not only in selectivity and quiet operation is the Lincoln 8-80 supreme. Its new audio transformer, utilizing the revolutionary Clough System to the fullest extent, gives it infinitely better tone, far more volume and less distortion than any other type of transformer can possibly provide. The effective transformation ratio per stage—exclusive of tube gain—averages 4.4 to 1, 50% greater than that of any other and more expensive transformers, and with all this,—true reproduction, fidelity of tone, and positively uncanny realism.

Even in appearance, the 8-80 is far ahead of any factory-built receiver at anywhere near its price. The beautiful Lincoln 112 two-tone metal shielding cabinet (\$9.25 additional) houses the completed receiver and at the same time provides 100% perfect shielding. It is ALL of these features that make the 8-80 the sweetest super you've ever tuned. And that is positively what it is!

The price of the complete kit for the 8-80 is \$92.65. And the set you build from it will give these same results, for every set built tunes easily and positively to peak efficiency, thanks to the new principle of William H. Hollister—an old-timer in the game who demonstrated "wireless" to college professors before Marconi first bridged the Atlantic. And all his experience, ranging over a quarter of a century, has gone into the 8-80. It OUGHT to be some set—AND IT IS!

Lincoln guarantees that the 8-80 will give better results than any other eight tube super you can build.

If you want an evening full of straight-from-the-shoulder super-heterodyne dope written by an engineer who has played with every super going in the last few years, send 25 cents for William H. Hollister's "Secret of the Super," using the coupon below.

LINCOLN ENGINEERING SERVICE ON STANDARD KITS

DO **YOU** KNOW THAT

you can buy the really finer standard kits—those that have come up to the rigid standards of performance set by the Lincoln Laboratories—at standard prices, and at standard discounts if you are a professional setbuilder or dealer? The Lincoln Engineering Service means a lot—you are assured not only of same-day shipment, but you have the double assurance of factory inspection, PLUS Lincoln inspection—and Lincoln offers you only complete kits that exhaustive tests have proven to be right—AND THEN FULLY GUARANTEES EACH TO YOU.

Order today for immediate shipment any of the following Lincoln-Guaranteed complete kits:

Sargent-Rayment Seven (S-M 710) kit.....	\$120.00	Tyrman 80—super—less power pack.....	\$134.50
S-M 720 Screen Grid Six.....	72.50	Tyrman 72 receiver kit.....	98.50
S-M 720 Screen Grid Six—factory wired.....	102.00	Tyrman 72AC, with power pack.....	153.50
1929 Laboratory Superheterodyne.....	95.70	Scott World's Record 9-tube S.G. super.....	138.10
		H.F.L. Isotone 10-tube super.....	195.00

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533-39 Market St., San Francisco, Calif.

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Address.....

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

KWKC

1370 kc, Kansas City, Mo., Wilson Duncan Broadcasting Co., 100 w.

KWKH

850 kc, Kennonwood, La., W. K. Henderson, 20,000 w, C. Shared.

KWLC

1270 kc, Decorah, Iowa, Luther College, 50 w, C. Shared.

KWSC

1390 kc, Pullman, Wash., State College of Washington, 500 w, P. "The Voice of the Cougars." Shared.

KWTC

1500 kc, Santa Ana, Calif., Pacific Broadcasting Fed., 100 w, P. "Kum West to California." Shared.

KWWG

1260 kc, Brownsville, Texas, Chamber of Commerce, 500 w, C. "Good Night, World." Shared.

KXA

570 kc, Seattle, Wash., American Radio Tel. Co., 500 w, P. Shared.

KXL

1250 kc, Portland, Ore., KXL Broadcasters, Inc., 1000 w, P. "The Voice of Portland." Shared.

KXRO

1420 kc, Aberdeen, Wash., KXRO, Inc., 50 w.

KYA

1230 kc, San Francisco, Calif., Pacific Broadcasting Corp., 1000 w, P.

KYW

1020 kc, Chicago, Ill., Westinghouse E. & M. Co., 5000 w, C.

KZM

1370 kc, Hayward, Calif., Leon P. Tenney, 100 w, P. Shared.

NAA

690 kc, 434.5 m. United States Navy Department, Washington, D. C., 1000 w. "Where the Time Signals Originate." E.

WAAD

1420 kc, Cincinnati, Ohio, Ohio Mechanic Institute, 25 w, E.

WAAF

920 kc, Chicago, Ill., Drivers Journal Pub. Co., 500 w daytime, C.

WAAM

1250 kc, Newark, N. J., WAAM, Inc., 500 w, E. "Sunshine Station."

WAAT

1070 kc, Jersey City, N. J., Bremer Broadcasting Corp., 250 w. Shared.

WAAW

660 kc, Omaha, Neb., Omaha Grain Exchange, 500 w daytime, C. "Pioneer Market Station of the West."

WABC

860 kc, New York City, N. Y., Atlantic Broadcasting Corp., 5000 w, E.

WABF

1440 kc, Kingston, Pa., Markle Broadcasting Corp., 250 w, E. "The Voice of Wyoming Valley." Shared.

WABI

1200 kc, Bangor, Maine, First Universalist Church, 100 w, E. "The Pine Tree Wave."

WABY

1310 kc, Philadelphia, Pa. J. Magaldi, Jr., 50 w.

WABZ

1200 kc, New Orleans, La., Coliseum Place Baptist Church, 50 w, C.

WADC

1320 kc, Akron, Ohio, Allen T. Simmons, 1000 w, E. shared, "Watch Akron Develop Commercially."

WAFD

1500 kc, Detroit, Mich., Albert B. Parfet Co., 100 w, E.

WAGM

1310 kc, Royal Oak, Mich., Robert L. Miller, 50 w, E.

WAIU

640 kc, Columbus, Ohio, American Insurance Union, 5000 w, E. shared, "The Radio Voice of the American Insurance Union."

WALK

1500 kc, Willow Grove, Pa., Albert A. Walker, 50 w, E.

WAPI

1140 kc, Auburn, Ala., Alabama Polytechnic Institute, 5000 w, C. Shared.

WASH

1270 kc, Grand Rapids, Mich., Baxter Laundries, Inc., 250 w, C. Shared.

WBAA

1400 kc, Lafayette, Ind., Purdue University, 500 w, C. Shared.

WBAA

1120 kc, Harrisburg, Pa., Pennsylvania State Police, 500 f, daytime, E. "The Voice of Pennsylvania."

WBAL

1060 kc, Glen Morris, Md., Consolidated Gas, Elec. Co., 5000 w, E. shared. "The Station of Good Music."

WBAA

1120 kc, Decatur, Ill., James Milliken University, 100 w.

WBAP

800 kc, Ft. Worth, Tex., Carter Publications, Inc., 5000 w, C. Shared.

WBAA

1490 kc, Nashville, Tenn., Waldum Drug Co., 5000 w, C. Shared.

WBAX

1210 kc, Wilkes-Barre, Pa., John H. Stenger, Jr., 100 w, E. "In Wyoming Valley, Home of the Anthracite."

WBBC

1400 kc, Brooklyn, N. Y., Brooklyn Broadcasting Corp., 500 w. Shared.

WBBL

1370 kc, Richmond, Va., Grace Covenant Presbyterian Church, 100 w, E. "Richmond, the Gateway North and South."

WBBM

770 kc, Glenview, Ill., Atlas Investment Co., 10,000 w, C.

WBBR

1300 kc, Rossville, N. Y., People's Pulpit Association, 500 w, E. shared. "Watch Tower."

WBBW

1200 kc, Norfolk, Va., Ruffner Junior High School, 100 w, E.

WBBY

1200 kc, Charleston, S. C., Washington Light Infantry, 75 w, E. "The Seaport of the Southeast."

WBBZ

1200 kc, Ponca City, Okla., C. L. Carrell, 100 w, C.

WBES

1310 kc, Salisbury, Ind., Tom F. Little, 100 w, E.

WBET

1360 kc, Medford, Mass., Boston, Transcript Co., 500 w, E. Shared.

WBIS

1230 kc, Boston, Mass., The Shepard Stores, 500 w, E.

WBMH

1310 kc, Detroit, Mich., Braun's Music House, 100 w, E.

WBMS

1450 kc, Union City, N. J., WBMS Broadcasting Corp., 100 w.

WBNY

1350 kc, New York, N. Y., Baruchrome Corp., 250 w, E. shared. "The Voice of the Heart of New York."

WBOW

1310 kc, Terre Haute, Ind., Banks of Wabash Broadcasting Assn., 100 w, C. "On the Banks of the Wabash."

WBRC

930 kc, Birmingham, Ala., Birmingham Broadcasting Co., 500 w, C. "The Biggest Little Station in the World."

WBRE

1310 kc, Wilkes-Barre, Pa., Louis G. Baltimore, 100 w, E.

WBRL

1430 kc, Tilton, N. H., Booth Radio Laboratories, 500 w, E. Shared.

WBSO

780 kc, Wellesley Hills, Mass., Babson's Statistical Org., Inc., 100 w, daytime, E.

WBT

1080 kc, Charlotte, N. C., C. C. Coddington, 5000 w, E. shared. "The Queen City of the South."

WBZ

990 kc, East Springfield, Mass., Westinghouse E. & M. Co., 15,000 w, E. shared. "The Broadcasting Station of New England."

WBZA

990 kc, Boston, Mass., Westinghouse E. & M. Co., 500 w, E. Shared.

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Spare time earnings are easy in Radio almost from the time you enroll. G. W. Page, 1807 21st Ave. S., Nashville, Tenn., made \$935 in his spare time while taking this course. Al. Johnson, 1409 Shelby St., Sandusky, O., \$1,000 in four months, and he didn't know the difference between a condenser and a transformer when he enrolled. I'll give you a legal contract, backed by N. R. I. pioneer and largest home-study Radio school in the world, to refund every penny of your money if you are not satisfied, upon completing, with the lessons and instructions received. Find out what Radio offers you—get the facts. Mail coupon—RIGHT NOW.

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Name.....Age.....
 Address.....
 Town.....State.....

WCAC

1330 kc, Storrs, Conn., Connecticut Agricultural College, 500 w, E, shared, "Voice From the Nutmeg State."

WCAD

1220 kc, Canton, N. Y., St. Lawrence University, 500 w, daytime, E, "The Voice of the North Country."

WCAE

1220 kc, Pittsburgh, Pa., Kaufman & Baer Co. 500 w, E, "Where Prosperity Begins."

WCAH

1430 kc, Columbus, Ohio, C. A. Entrekin, 250 w, E. Shared.

WCAJ

590 kc, Lincoln, Neb., Nebraska Wesleyan University, 500 w, C. Shared.

WCAL

1250 kc, Northfield, Minn., St. Olaf College, 1000 w, C, shared, "The College on the Hill."

WCAM

1280 kc, Camden, N. J., City of Camden, 500 w, E. Shared.

WCAO

600 kc, Baltimore, Md., Monumental Radio, Inc., 250 w, E, "The Gateway of the South."

WCAP

1280 kc, Asbury Park, N. J., Radio Industries Broadcast Co., 500 w, E. Shared.

WCAT

1200 kc, Rapid City, S. D., South Dakota State School of Mines, 100 w, M.

WCAU

1170 kc, Philadelphia, Pa., Universal Broadcasting Co., 5000 w, E, "Where Cheer Awaits U."

WCAX

1200 kc, Burlington, Vt., University of Vermont, 100 w, E, shared, "The Voice of the Green Mountains."

WCAZ

1070 kc, Carthage, Ill., Carthage College, 100 w, daytime.

WCBA

1500 kc, Allentown, Pa., Musselman & B. Bryan, 100 w, E. Shared.

WCBD

1080 kc, 344.6, Zion, Ill., Wilbur Glen Voliva, 5000 w, C. Shared.

WCBM

1370 kc, Baltimore, Md., Hotel Chateau, 100 w.

WCBS

1210 kc, Springfield, Ill., Dewing & Meester, 100 w.

WCCO

810 kc, Anoka, Minn., Washburn-Crosby Co., 10,000 w, C, "Service to the Northwest."

WCDA

1350 kc, New York City, N. Y., Italian Educational Broadcasting Co., 250 w. Shared.

WCFL

970 kc, Chicago, Ill., Chicago Federation of Labor, 1000 m, C, shared, "The Voice of Labor."

WCGU

1400 kc, Coney Island, N. Y., Chas. G. Unger, 500 w. Shared.

WCLB

1500 kc, Long Beach, Long Island, N. Y., Arthur Faske, 100 w, E, shared, "The Voice of Community Service."

WCLO

1200 kc, Kenosha, Wis., C. Whitmore, 100 w, C. Shared.

WCLS

1310 kc, Joliet, Ill., WCLS, Inc., 100 w. Shared.

WCMA

1400 kc, Culver, Ind., Culver Military Academy, 500 w, C, shared, "The Voice of Culver."

WCOA

1120 kc, Pensacola, Fla., City of Pensacola, 500 w, E, "Wonderful City of Advantages."

WCOC

880 kc, Columbus, Miss., Crystal Oil Co., 500 w, C.

WCOH

1210 kc, Greenville, N. Y., Westchester Broadcasting Corp., 100 w, E. Shared.

WCRW

1210 kc, Chicago, Ill., Clinton R. White, 100 w. Shared.

WCSH

940 kc, Portland, Me., Congress Square Hotel Co., 500 w, E, "The Voice From Sunrise Land."

WCSSO

1380 kc, Springfield, Ohio, Wittenberg College, 500 w, E. Shared.

WCWK

1230 kc, Ft. Wayne, Ind., Chester W. Keen, 500 w, daytime.

WCX

750 kc, Pontiac, Mich., WJR, Inc., and Detroit Free Press, 5000 w, E.

WDAE

620 kc, Tampa, Fla., Tampa Publishing Co., 1000 w, E, "WDAE, the Voice of the Times at Tampa."

WDAF

610 kc, Kansas City, Mo., Kansas City Star Co., 1000 w, C, shared, "Enemies of Sleep."

WDAG

1410 kc, Amarillo, Texas, J. Lawrence Martin, 1000 w, C, shared, "Where Dollars Always Grow."

WDAH

1310 kc, El Paso, Texas, Trinity Methodist Church, 100 w, M.

WDAY

1280 kc, Fargo, N. D., Radio Equipment Corp., 1000 w, C. Shared.

WDBJ

930 kc, Roanoke, Va., Richardson-Wayland Elec. Corp., 250 w, E, shared, "The Magic City."

WDBO

620 kc, Orlando, Fla., Rollins College, Inc., 1000 w, E, shared, "Down Where the Oranges Grow."

WDEL

1410 kc, Wilmington, Del., WDEL, Inc., 250 w, E, shared, "First City of the First State."

WDGY

1410 kc, Minneapolis, Minn., Dr. Geo. W. Young, 500 w, C. Shared.

WDOD

1280 kc, Chattanooga, Tenn., Chattanooga Radio Co., Inc., 1000 w, C.

WDRC

1330 kc, New Haven, Conn., Doolittle Radio Corp., 500 w, E. Shared.

WDSU

1270 kc, New Orleans, La., Jos. H. Uhalt, 1000 w, C.

WDZ

1070 kc, Tuscola, Ill., James L. Bush, 100 w, daytime. Shared.

WEAF

660 kc, Bellmere, N. Y., National Broadcasting Co., Inc., 50,000, w, E.

WEAN

1160 kc, Providence, R. I., The Shepard Co., 500 w, E, "We Entertain a Nation."

WEAO

550 kc, Columbus, Ohio, Ohio State University, 750 w, E. Shared.

WEAR

1070 kc, Cleveland, Ohio, Willard Storage Battery Co., 1000 w, E. Shared.

WEBC

1280 kc, Superior, Wis., Head of The Lakes Broadcasting Co., 1000 w, C. Shared.

WEBE

1210 kc, Cambridge, Ohio, Roy W. Waller, 10w, E.

WEBQ

1210 kc, Harrisburg, Ill., Tate Radio Co., 50 w. Shared.

WEBR

1310 kc, Buffalo, N. Y., H. H. Howell, 100 w, E, "We Extend Buffalo's Regards."

WEBW

600 kc, Beloit, Wis., Beloit College, 250 w. daytime.

WEDC

1210 kc, Chicago, Ill., Emil Denmark, Inc., 100 w. Shared.

WEDH

1420 kc, Erie Dispatch-Herald, Erie, Pa., 30 w, E.

WEEL

590 kc, Boston, Mass., Edison Elec. Illum. Co., 500 w, E, "The Friendly Voice."

WEHS

1310 kc, Evanston, Ill., Victor C. Carlson, 100 w. Shared.

WEMC

680 kc, Berrien Springs, Mich., Emmanuel Missionary College, 1000 w, C, "The Radio Lighthouse."



From This Remarkable Laboratory Have Come the World-Startling Victoreen Radio Achievements!

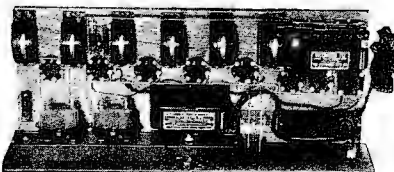
HERE, in what is perhaps one of the most complete laboratories of the radio world, Nature has unfolded some of her choicest radio secrets. Many remarkable things have been accomplished here. For instance, months before the world knew of such a thing as photographing

sound, it was done in this laboratory almost as easily as photographing objects.

Undoubtedly there's genius in the engineering of Victoreen—set builders have said that time and again—for Victoreen Engineers work with no regard for the commonplace. Day after day, night after night, these laboratories beacon out the news that genius is busy—new achievements in

the making.

And so it is perfectly evident why the Victoreen "Super" surprises the radio world—why it is so far in advance of ordinary radio—why it continues to set a swift pace in radio history.



A New Victoreen A. C. Circuit

The surprise of the year! Using the new Victoreen R. F. Transformers—vastly improved—each individually tuned to a precision of less than 1/4 of 1% by the Victoreen patented method, it is literally years ahead.

FREE BLUE PRINTS

The new Victoreen A. C. Circuit, the new Victoreen Universal Circuit, the new "B" supply and the new "C" supply are shown in blue print form, together with lists of parts and complete constructional data. Write today for the ones you want—sent free.



The Victoreen "B" Power Supply

Supplies 45, 90, 180 and 450 volts, using a UX210 or 250 in the last stage. Contains two voltage regulator tubes so that the 90 and 180 volt taps are supplied with a constant volt potential. Used with the Victoreen "Super," nothing approaches it.

THE GEORGE W. WALKER CO., Merchandisers of Victoreen Radio Products, 2825 Chester Avenue, Cleveland, Ohio

Victoreen

WENR

870 kc, Chicago, Ill., Great Lakes Radio Broadcasting Co., 5000 w, C, "Voice of Service."

WEPS

1200 kc, Gloucester, Mass., Matheson Radio Co., Inc., 100 w, E. Shared.

WEVD

1300 kc, Woodhaven, N. Y., Debs Memorial Radio Fund, 500 w. Shared.

WEW

760 kc, St. Louis, Mo., St. Louis University, 1000 w, daytime, C.

WFAA

1040 kc, Dallas, Texas, Dallas Morning News, 5000 w, C, "Working for All Alike." Shared.

WFAN

610 kc, Philadelphia, Pa., Keystone Broadcasting Co., Inc., 500 w, E.

WFBC

1200 kc, Knoxville, Tenn., First Baptist Church, 50 w.

WFBE

1200 kc, Cincinnati, Ohio, Park View Hotel 100 w.

WFBG

1310 kc, Altoona, Pa., William F. Gable Co., 100 w, E, "The Original Gateway to the West and We Wish You All the Very Best."

WFBJ

1370 kc, Collegeville, Minn., St. Johns University, 100 w, C, "In the Heart of the Landscape Paradise."

WFBL

900 kc, Syracuse, N. Y., The Onondaga Co., Inc., 750 w, E, "When Feeling Blue, Listen." Shared.

WFBM

1230 kc, Indianapolis, Ind., Indianapolis Power & Light Co., 1000 w, C, "The Crossroads of America." Shared.

WFBR

1120 kc, Baltimore, Md., Baltimore Radio Show, Inc., 250 w, E, "Home of the Star Spangled Banner."

WFCl

1210 kc, Pawtucket, R. I., Frank Crook, Inc., 100 w, E, "The City of Diversified Industries." Shared.

WFDF

1310 kc, Flint, Mich., Frank D. Fallain, 100 w, E.

WFI

560 kc, Philadelphia, Pa., Strawbridge & Clothier, 500 w, E. Shared.

WFIW

940 kc, Hopkinsville, Ky., The Acme Mills, Inc., 1000 w, C.

WFJC

1450 kc, Akron, Ohio, W. F. Jones Broadcasting, Inc., 500 w, E. Shared.

WFKD

1310 kc, Frankford, Pa., Foulkrod Radio Eng. Co., 50 w, E.

WFLA

900 kc, Clearwater, Fla., Clearwater Chamber of Commerce, 1000 w, E, "Inviting the World to the Springtime City." Shared.

WGAL

1310 kc, Lancaster, Pa., Lancaster Elec. Sup. & Const. Co., 15 w, E, "World's Gardens at Lancaster."

WGBC

1210 kc, Freeport, N. Y., Harry H. Carman, 100 w, E, "The Voice of the Sunrise Trail." Shared.

WGBC

1430 kc, Memphis, Tenn., First Baptist Church, 500 w, C. Shared (Sunday only).

WGBF

630 kc, Evansville, Ind., Evansville on Air, 500 w, E, "Gateway to the South."

WGBI

880 kc, Scranton, Pa., Scranton Broadcasters, Inc., 250 w, E. Shared.

WGBS

1180 kc, Astoria, L. I., N. Y., Gimbel Bros., Inc., 500 w, E.

WGCM

1210 kc, Gulfport, Miss., Gulf Coast Music Co., Inc., 100 w, C.

WGCP

1250 kc, Newark, N. J., May Radio Broadcast Corp., 250 w. Shared.

WGES

1360 kc, Chicago, Ill., Oak Leaves Broadcasting Corp., 500 w, C, "World's Greatest Entertainment Service." Shared.

WGHP

1240 kc, Fraser, Mich., George Harrison Phelps, Inc., 750 w, E.

WGMS

1250 kc, Minneapolis, Minn., University of Minnesota, 1000 w, C. Shared.

WGN

720 kc, Elgin, Ill., Tribune Co., 15,000 w, C.

WGR

550 kc, Buffalo, N. Y., Federal Radio Corp., 750 w, E, "Key City of Industry." Shared.

WGST

890 kc, Atlanta, Ga., Georgia School of Technology, 500 w, E, "The Southern School with the National Reputation." Shared.

WGY

790 kc, South Schenectady, N. Y., General Electric Co., 50,000 w, E.

WHA

570 kc, Madison, Wis., University of Wisconsin, 750 w, C. Shared.

WHAD

900 kc, Milwaukee, Wis., Marquette University 250 w, C. Shared.

WHAM

1160 kc, Rochester, N. Y., Stromberg-Carlson Tel. Mfg. Co., 5000 w, E.

WHAP

1300 kc, New York, N. Y., Defenders of Truth Society, Inc., 500 w, E. Shared.

WHAS

820 kc, Louisville, Ky., The Courier Journal Co. & Louisville Times Co., 5000 w, C.

WHAZ

1300 kc, Troy, N. Y., Rensselaer Polytechnic Institute, 500 w, E. Shared.

WHB

950 kc, Kansas City, Mo., Sweeney Automobile School Co., 1000 w, C, "Kansas City, Mo., the Heart of America." Shared.

WHBA

1370 kc, Memphis, Tenn., Broadcasting Station WHBQ, Inc., 100 w, C.

WHBC

1200 kc, Canton, Ohio, St. John's Catholic Church, 10 w.

WHBD

1370 kc, Bellefontaine, Ohio, Chamber of Commerce, 100 w, E, "Ohio's Highest Point."

WHBF

1210 kc, Rock Island, Ill., Beardsley Specialty Co., 100 w.

WHBL

1410 kc, Sheboygan, Wis., Press Pub. Co., 1000 w, C. Shared.

WHBP

1310 kc, Johnstown, Pa., Johnstown Automobile Co., 100 w, E, "The Voice of the Friendly City."

WHBQ

1370 kc, Memphis, Tenn., Broadcasting Station WHBQ, Inc., 100 w, C.

WHBU

1210 kc, Anderson, Ind., Citizens Bank, 100 w, C, "First Hoosier Bank on the Air."

WHBW

1500 kc, Philadelphia, Pa., D. R. Kienzie, 100 w, E.

WHBY

1200 kc, 249.9 m, West De Pere, Wis., St. Norbert's College, 50 w.

WHDI

1410 kc, Minneapolis, Minn., Wm. Hood Dunwoody Ind. Inst., 500 w, C.

WHEC

1440 kc, Rochester, N. Y., Hickson Electric Co., Inc., 250 w, E. Shared.

WHFC

1310 kc, Chicago, Ill., Goodson & Wilson, Inc., 100 w. Shared.

WHK

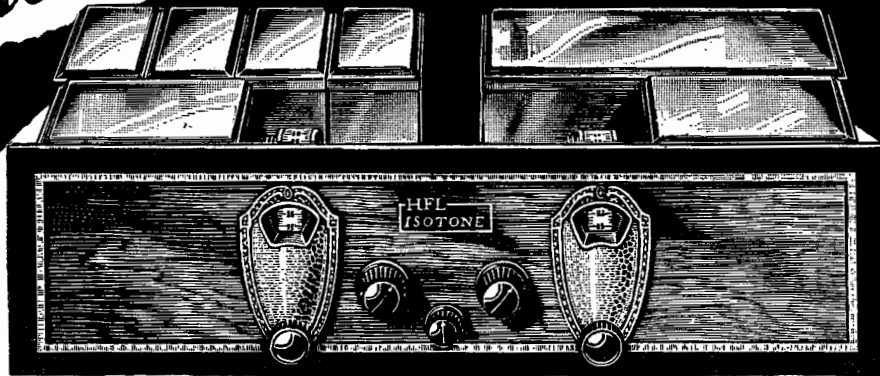
1390 kc, Cleveland, Ohio, Radio Air Service Corp., 500 w, E, "Cleveland's Pioneer Station." Shared.

WHN

1010 kc, New York, N. Y., George Schubel, 250 w, E, "Voice of the Great White Way." Shared.

HFL

Distance Range That Staggeres the Imagination!
With the Wonder Receiver of the Century



The Model 10 HFL Isotone

SCREENED GRID . . . CUSTOM BUILT . . . RADIO PHONOGRAPH

2000-3000 Mile Range
 So sensitive is the HFL Isotone that stations over 2000 miles away have to be turned down. Tremendous volume is obtained from stations all over the North American continent. The HFL Isotone will receive any station in the world that is putting enough signal voltage into the antenna to actuate the first tube in the receiver.

One Spot Tuning

The 450 kilo cycle screened grid amplifier allows absolute one spot tuning. Extreme selectivity is gained by hand tuning each transformer with a small variable condenser. An entirely new method of control permits the tubes to be operated in their most sensitive condition — just below the

oscillating point. The HFL Isotone will actually select an 8 kilo cycle band when the amplifier is worked at maximum. Dual detection (an exclusive HFL development) allows reception of the weakest signals and still permits the undistorted handling of powerful locals.

A. C. or D. C. Operation

Through the use of an ingenious system of filament control, the HFL Isotone operates perfectly with batteries or the special HFL—A. C. power supply. The same tremendous reserve power is available with batteries. The same crystal clear tones are developed with A. C. Only 30 mils. of plate current are required by the entire receiver including the two power tubes.

Phonograph or Radio

A special method of switching and ballasting allows an instant choice of phonograph or radio music by simply throwing the master control switch on the front panel. Both kinds of music are so amazingly realistic that no human ear can discern the difference between an original selection and an HFL reproduction. An automatic ballasting shunt—another exclusive HFL feature—prevents audio tube overloading when the six radio frequency tubes are disconnected during phonograph operation. The three stage, push pull audio amplifier is a marvel of electrical design. Not only does it faithfully reproduce every musical frequency, but it actu-

ally corrects the flaws in broadcast transmissions and phonograph records.

45 Minute Construction

The HFL unit method of construction is the sensation of the 1929 radio season. Every item necessary to build a perfect Isotone comes in a factory sealed carton. Each of the three main units is wired and laboratory tested at the factory. Only ten wires are connected by the set builder. An exact, progressive method of assembly eliminates every chance of error. We stand ready to prove, at any time, that a standard HFL Isotone can be fully constructed in less than forty-five minutes.

Absolute Guarantee

We guarantee, absolutely, that a standard HFL Isotone receiver operating under favorable conditions will receive over a distance of not less than 1500 miles. We guarantee every HFL unit to be mechanically and electrically perfect. Any unit believed defective will be immediately replaced at no extra charge. We reserve the right to select a location and prove by demonstration that it will receive over 1500 miles.

Set Builders write for special data

Free circuit diagrams and all information

Mail this Coupon Today ~

HIGH FREQUENCY LABORATORIES

28 North Sheldon Street
 Chicago, Illinois

SEND THIS NOW!

HIGH FREQUENCY LABORATORIES
 Office 4 — 28 N. Sheldon St., Chicago, Ill.

Gentlemen: Without obligation please send your new ISOTONE booklet.

Name _____

Address _____

City _____ State _____

Please print plainly

WHO

1000 kc, Des Moines, Iowa, Bankers Life Co., 5000 w, C, "W-H-O, Who? Banker's Life, Des Moines." Shared.

WHPP

1420 kc, New York, N. Y., Bronx Broadcasting Co., 10 w, E. Shared.

WHT

1470 kc, Deerfield, Ill., Radiophone Broadcasting Corp., 5000 w. Shared.

WIAD

1310 kc, Philadelphia, Pa., Howard R. Miller, 100 w, E.

WIAS

1420 kc, Ottumwa, Iowa, Poling Electric Co., 100 w. daytime. Shared.

WIBA

1210 kc, Madison, Wis., Capital Times-Strand Theater Station, 100 w.

WIBG

930 kc, Elkins Park, Pa., St. Paul's P. E. Church, 50 w, daytime, E.

WIBM

1370 kc, Jackson, Mich., C. L. Carrell, 100 w.

WIBO

1480 kc, Desplaines, Ill., WIBO, Inc., 5000 w, C. Shared.

WIBR

1420 kc, Steubenville, Ohio, Thurman A. Owjings, 50 w, E, "Where Investments Bring Results."

WIBU

1310 kc, Poynette, Wis., The Electric Farm, 100 w.

WIBW

1300 kc, Topeka, Kan., C. L. Carroll, 1000 w, C, "Topeka—Where Investment Brings Wealth." Shared.

WIBX

1200 kc, Utica, N. Y., WIBX, Inc., 100 w, E.

WIBZ

1500 kc, Montgomery, Ala., Alexander D. Trum, 15 w, C, "We Interest Business Zeal."

WICC

1430 kc, Easton, Conn., Bridgeport Broadcasting Station, Inc., 500 w, E, "The Industrial Capital of Connecticut." Shared.

WIL

1350 kc, St. Louis, Mo., WIL Broadcasting Co., 1000 w, C, "A Wave Length Ahead." Shared.

WINR

1210 kc, Bayshore, N. Y., Radiotel Mfg. Co., 100 w, E, shared, "The Garden Spot of Long Island."

WIOD

1240 kc, Miami Beach, Fla., Carl G. Fisher Co., 1000 w, E, "Wonderful Isle of Dreams." Shared.

WIP

610 kc, Philadelphia, Pa., Gimbel Bros., Inc., 500 w, E, "Watch Its Progress."

WISN

1120 kc, Milwaukee, Wis., Evening Wisconsin Co., 250 w, C.

WJAD

1240 kc, Waco, Texas, Frank P. Jackson, 1000 w, C, shared, "Waco, Texas, All Around It."

WJAG

1060 kc, Norfolk, Neb., Norfolk Daily News, 500 w, C, shared, "Home of the Printer's Devil."

WJAK

1310 kc, Kokomo, Ind., J. A. Kautz, 50 w. Shared.

WJAM

1200 kc, Waterloo, Iowa, Waterloo Broadcasting Co., 100 w, C. Shared.

WJAR

880 kc, Providence, R. I., The Outlet Co., 250 w, E, "The Southern Gateway of New England."

WJAS

1290 kc, Pittsburgh, Pa., Pittsburgh Radio Supply House, 500 w, E.

WJAX

1260 kc, Jacksonville, Fla., City of Jacksonville, 1000 w, E, shared, "WJAX—W for Wonderful, JAX for Jacksonville."

WJAY

1450 kc, Cleveland, Ohio, Cleveland Radio Broadcasting Corp., 500 w, E. Shared.

WJAZ

1480 kc, Mt. Prospect, Ill., Zenith Radio Corp., 5000 w, C. Shared.

WJBB

1010 kc, Sarasota, Fla., Financial Journal, Inc., 250 w, E, "The Pioneer Semi-Tropical Business Journal."

WJBC

1200 kc, LaSalle, Ill., Hummer Furniture Co., 100 w. Shared.

WJBI

1210 kc, Red Bank, N. J., Robt. S. Johnson, 100 w. Shared.

WJBK

1370 kc, Ypsilanti, Mich., Ernest F. Goodwin, 50 w, C.

WJBL

1200 kc, Decatur, Ill., Wm. Gushard Dry Goods Co., 100 w. Shared.

WJBO

1370 kc, New Orleans, La., Valdemar Jensen, 100 w, C.

WJBU

1210 kc, Lewisburg, Pa., Bucknell University, 100 w, E, shared, "In the Heart of the Keystone State."

WJBW

1200 kc, New Orleans, La., C. Carlsen, Jr., 30 w, C, shared, "The Serve You Broadcasting Station at New Orleans."

WJBY

1210 kc, Gadsden, Ala., Electric Cons. Co., 50 w, C.

WJJD

830 kc, Mooseheart, Ill., Loyal Order of Moose, 20,000 w, C, shared, "Every Child Is Entitled to a High School Education and a Trade." Shared.

WJKS

1360 kc, Gary, Ind., Johnson-Kennedy Radio Corp., 500 w, C. Shared.

WJZ

660 kc, New York City, N. Y., Radio Corporation of America, 30,000 w, E.

WKAQ

580 kc, San Juan, Porto Rico, Radio Corp. of Porto Rico, 500 w, E, "Porto Rico, The Island of Enchantment in the Caribbean Sea."

WKAR

1040 kc, East Lansing, Mich., Michigan State College, 500 w, daytime, E.

WKAV

1310 kc, Laconia, N. H., Laconia Radio Club, 50 w, E, "The Voice of the Winnepesaukee Lake Region."

WKBB

1310 kc, Joliet, Ill., Sanders Bros., 100 w. Shared.

WKBC

1310 kc, Birmingham, Ala., H. L. Ansley, 10 w, C.

WKBE

1200 kc, Webster, Mass., K. & B. Electric Co., 100 w, E. Shared.

WKBF

1400 kc, Indianapolis, Ind., Noble Butler Watson, 500 w, C, shared, "We Keep Building Friendships."

WKBH

1380 kc, LaCrosse, Wis., Callaway Music Co., 1000 w, shared.

WKBI

1310 kc, Chicago, Ill., Fred L. Schoenwolf, 50 w. Shared.

WKBN

570 kc, Youngstown, Ohio, W. P. Williamson, Jr., 500 w, E. Shared.

WKBO

1450 kc, Jersey City, N. J., Camith Corp., 250 w. Shared.

WKBP

1420 kc, Battle Creek, Mich., Enquirer-News Co., 50 w, E.

WKBQ

1350 kc, New York, N. Y., Standard Cahill Co., Inc., 250 w, E. Shared.

WKBS

1310 kc, Galesburg, Ill., Permil N. Nelson, 100 w. Shared.

WKBT

1420 kc, New Orleans, La., First Baptist Church, 50 w, C.

WKBV

1500 kc, Brookville, Ind., Knox Battery & Electric Co., 100 w, C.

WKBW

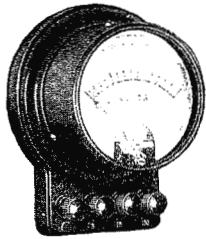
1470 kc, Buffalo, N. Y., Buffalo Broadcasting Co., 5000 w, E, shared.

WKBZ

1500 kc, Ludington, Mich., K. L. Ashbacher, 50 w.

JEWELL INSTRUMENTS

**Durable
Reliable
Satisfactory**



Pattern No. 77
Portable Instrument—for the Set Owner and for Service Work

In the Pattern No. 77 is provided an instrument which is very flexible in its adaption to the problems arising with the universal adoption of A. C. radio sets and allied equipment. It enables checking line and filament voltages and also the condition of transformer primaries and secondaries in charging devices and power supply units. Trouble in the devices named may be quickly located with the Pattern No. 77, for its combination ranges of 0-3-15-150 volts are ample to cover all ordinary tests. It is a good instrument for the set owner and one of the best additions that can be made to a service man's kit of service equipment.



Pattern No. 199
Radio Set Analyzer—for the Dealer and Service Man

A radio set analyzer offered to the dealer and service man in the belief that it is the most useful and reliable service instrument ever produced. The workmanship and material are of the finest throughout and every test which will give useful information of the workings of a radio set and its accessories has been provided for. It tests A. C. and D. C. tubes, A and B eliminators, batteries, circuits, grid, plate and cathode voltages, plate milliamperes, chargers, line voltage, etc. Ranges of the instruments are 0-4-8-16-160 A. C. Volts, 0-7.5-75-300-600 D. C. Volts, and 0-15-150 Milliamperes. All D. C. voltage ranges have a resistance of 1000 ohms per volt. It is the favorite instrument of dealers and service men.

Durable — Reliable — Satisfactory — a good description of Jewell instruments and also the reasons for their general acceptance as the testing standard by the radio fraternity.

Every phase of radio testing requirements is covered by the extensive line of Jewell radio instruments. Manufacturers, jobbers, dealers, service men, amateurs, set builders and set owners—all have found Jewell instruments the solution to their various testing difficulties.

Jewell instruments are sturdy and accurate and will stand an unusual amount of hard usage without becoming inaccurate. They are popular because there are so many styles and ranges from which to choose and because they are so entirely satisfactory.

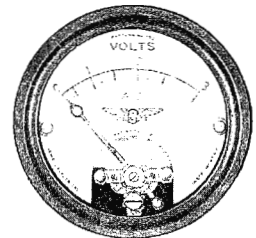
Ask your radio dealer for information regarding Jewell instruments, or write us for a copy of our radio instrument catalog No. 15-C. It is yours on request.



"28 Years Making Good Instruments"

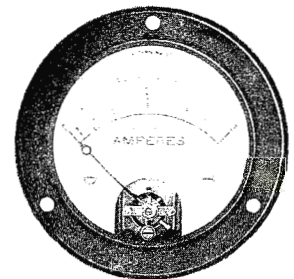
Jewell Electrical Instrument Company

1650 Walnut Street ~ Chicago, Illinois



Pattern No. 190
Panel Instrument—for the Set Owner and Builder

A flush type, 2-inch, alternating current instrument of moderate size and good appearance. It will be found very valuable for filament control of the new alternating current tubes for it is frequently found that a particular setting of the filament voltage is required to eliminate objectionable hum. It is furnished in ranges of 0-1.5, 0-3, 0-5, 0-8, 0-10, 0-15 and 0-150 volts. The movement of Pattern No. 190 is of the moving vane type with special modifications for the small size case. The instrument is accurate and is designed for continuous service with a very small energy consumption.



Pattern No. 64
Transmitting Instrument—for the Amateur

This instrument is a member of the famous Jewell Trio of transmitting instruments for amateurs. It is a thermocouple type and is guaranteed to stand an overload of 30%. The loss in the instrument is less than one-half of the minimum required by the Navy. The thermocouples are made from special furnace alloys of non-oxidizing nature and are worked at a low temperature to give a high overload capacity. The case is three inches in diameter with a 3/4-inch flange. Scales are silver etched and all visible parts are silver plated. For the amateur and experimenter in short wave work, no better instrument is available.

WKEN

1040 kc, Buffalo, N. Y., WKEN, Inc., 750 w, E. Shared.

WKJC

1200 kc, Lancaster, Pa., Kirk Johnson & Co., 50 w, E.

WKRC

550 kc, Cincinnati, Ohio, Kodel Radio Corp., 500 w, E.; "WKRC, K—Kodel, R—Radio, C—Corporation."

WKY

900 kc, Oklahoma City, Okla., WKY Radiophone Co., 1000 w, C.

WLAC

1490 kc, Nashville, Tenn., Life & Casualty, Ins. Co., 5000 w, C, shared, "The Thrift Station."

WLAP

1200 kc, Louisville, Ky., L. W. Benedict, 30 w, C.

WLBC

1310 kc, Muncie, Ind., Donald A. Burton, 50 w, Shared.

WLBF

1420 kc, Kansas City, Mo., Everett L. Dillard, 300 w, C, "Where Listeners Become Friends."

WLBG

1200 kc, Petersburg, Va., Robert Allen Gamble, 100 w, E.

WLBH

1420 kc, Farmingdale, N. Y., Joseph J. Lombardi, 30 w, Shared.

WLBL

900 kc, Stevens Point, Wis., Wisconsin Department of Markets, 1000 w, daytime, C, "Wisconsin, Land of Beautiful Lakes."

WLBO

1310 kc, Galesburg, Ill., Fred Trebbe, Jr., 100 w, C, Shared.

WLBV

1210 kc, Mansfield, Ohio, Mansfield Broadcasting Association, 100 w, E.

WLBW

1260 kc, Oil City, Pa., Petroleum Telephone Co., 500 w, E.

WL BX

1500 kc, Long Island City, N. Y., John N. Brahy, 100 w, Shared.

WL BZ

620 kc, Dover-Foxcroft, Me., Thompson L. Guernsey, 500 w, E.

WL CI

1210 kc, Ithaca, N. Y., Lutheran Assn. of Ithaca, 50 w, E.

WL EX

1420 kc, Lexington Air Station, 50 w, E. Shared.

WL IT

560 kc, Philadelphia, Pa., Lit Brothers, 500 w, E, shared, "The Quaker City Siren."

WL OE

1500 kc, Chelsea, Mass., William S. Pote, 100 w, Shared.

WLS

870 kc, Crete, Ill., Sears-Roebuck & Co., 5000 w, C, shared, "World's Largest Store, 'Work Better, Live Better, Sell Better.'" Shared.

WLSI

1370 kc, Cranston, R. I., Dutee W. Flint, 100 w, E. Shared.

WL TH

1400 kc, Brooklyn, N. Y., Voice of Brooklyn, Inc., 250 w, E. Shared.

WL W

700 kc, Cincinnati, Ohio, Crosley Radio Corp., 5000 w, E. Shared.

WL WL

1100 kc, New York, N. Y., Missionary Society of St. Paul, 5000 w, 6-8 pm, E. Shared.

WM AC

1440 kc, Casenovia, N. Y., Olive B. Meredith, 500 w, E, shared, "Voice of Central New York."

WM AF

1360 kc, Dartmouth, Mass., Round Hills Radio Corp., 500 w, E. Shared.

WM AK

900 kc, Lockport, N. Y., WMAK Broadcasting System, Inc., 750 w, E. Shared.

WM AL

630 kc, Washington, D. C., M. A. Leese Co., 250 w, E. Shared.

WM AN

1210 kc, Columbus, Ohio, W. E. Hesritt, 50 w, E.

WM AQ

670 kc, Elmhurst, Ill., Chicago Daily News, Inc., 5000 w, C.

WM AY

1200 kc, St. Louis, Mo., Kingshighway Presbyterian Church, 100 w.

WM AZ

890 kc, Macon, Ga., Mercer University, 500 w, E, shared, "Watch Mercer Attain Zenith." Shared.

WM BA

1500 kc, Newport, R. I., LeRoy Joseph Beebe, 100 w, E.

WM BC

1420 kc, Detroit, Mich., Michigan Broadcasting Co., Inc., 100 w, E.

WM BD

1440 kc, Peoria Heights, Ill., Peoria Heights Radio Laboratory, 500 w, Shared.

WM BF

560 kc, Miami Beach, Fla., Fleetwood Hotel Corp., 500 w, E, shared, "Wonderful Miami Beach Fleetwood."

WM BG

1210 kc, Richmond, Va., Havens & Martin, Inc., 100 w, E, "The Daytime Station."

WM BH

1420 kc, Joplin, Mo., Edwin Dudley Aber, 100 w, C, "Where Memories Bring Happiness."

WM BI

1080 kc, Addison, Ill., Moody Bible Institute, 5000 w, C, shared, "The West Point of Christian Service."

WM BL

1310 kc, Lakeland, Fla., Benford's Radio Studios, 100 w, E, "Lakeland—The City of Heart's Desire."

WM BM

1500 kc, Memphis, Tenn., Seventh Day Adventist Church, 10 w, C.

WM BO

1370 kc, Auburn, N. Y., Radio Service Laboratories, 100 w, E.

WM BQ

1500 kc, Brooklyn, N. Y., Paul J. Gollhofer, 100 w, Shared.

WM BR

1210 kc, Tampa, Fla., F. J. Reynolds, 100 w, E, "WMBR, Everything for Radio at Tampa, Fla."

WM BS

1430 kc, Lemoyne, Pa., Mack's Battery Co., 250 w, E. Shared.

WM C

780 kc, Memphis, Tenn., Memphis Commercial Appeal, Inc., 500 w, C, "WMC, Memphis, Down in Dixie."

WM CA

570 kc, Hoboken, N. J., Greeley Square Hotel Co., 500 w, E, shared, "Where the White Way Begins."

WM ES

1500 kc, Boston, Mass., Massachusetts Educational Society, 50 w, Shared.

WM PC

1310 kc, Lapeer, Mich., First Methodist Protestant Church, 30 w, E, "Where Many Preach Christ."

WM RJ

1420 kc, Jamaica, N. Y., Peter J. Prinz, 10 w, E, shared, "The Gateway of the Sunrise Trail."

WM SG

1350 kc, New York, N. Y., Madison Square Garden Broadcast Co., 250 w, E. Shared.

WN AD

1010 kc, Norman, Okla., University of Oklahoma, 500 w, C, shared, "The Voice of Soonerland."

WN AT

1310 kc, Philadelphia, Pa., Lenning Brothers Co., 100 w, E.

WN AX

890 kc, Yankton, S. Dak., Gurney Seed & Nursery Co., Dakota Radio Apparatus Co., 500 w, C. Shared.

WN BF

1500 kc, Endicott, N. Y., Howitt-Wood Radio Co., 50 w, E, "The Voice of the Triple Cities."

WN BH

1450 kc, New Bedford, Mass., New Bedford Broadcasting Co., 250 w, E, shared, "The Gateway to Cape Cod."

EARNED \$500 SPARE TIME WITH RADIO

Coplay, Pa., June 4—(RA)—During the few months that Frank J. Deutsch has been a member of the Radio Association of America, he has made over \$500 out of Radio in his spare time.

"Four super-hetrodyne sets of my own construction brought me a profit of \$60.00 each, and the other profit was from sales of supplies purchased through the Wholesale Department of the Association," he said. "The Association certainly has a great plan for ambitious men."

In a neighboring state, Werner Eichler, Rochester, N. Y., another member of the Association, has been making \$50 a week during his spare time.

They are only two of the hundreds of Radio Association members who are making money out of Radio in their spare time.

BECOMES RADIO ENGINEER IN ONE YEAR

Toronto, Canada, May 20 — (RA) — One of the newly admitted associate members of the Institute of Radio Engineers is Claude DeGrave, a member of the engineering staff of the DeForest Company of this city. "I knew nothing about Radio and started from the ground up." Mr. DeGrave stated, "when I enrolled a year ago in the Radio Association. Its easy lessons and superb training made it possible for me to become a Radio Expert in less than a year's time. My income is now about 225% more than at the time I joined the Association."

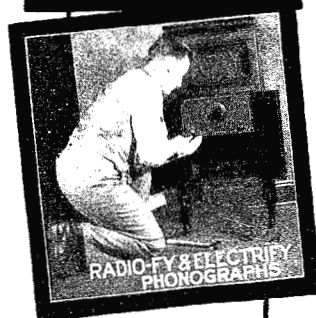
The Institute of Radio Engineers is a very exclusive organization, and its membership requirements are very rigid, so that Mr. DeGrave has reason to be proud of his election.

Clerk Doubles Income In Six Months Through Radio

Chicago, Ill., May 9—Even though his membership in the Radio Association has resulted in W. E. Thon securing the managership of a Radio Department in a large Chicago store, his ambition was not satisfied. Six months later, he started his own store.

"The Radio Association has an excellent plan for the man who wants to get out of the rut and succeed," says this man who quickly rose from clerkdom to the proprietorship of a profitable radio store. "I attribute my success entirely to the Radio Association of America. Six months after I had enrolled, I had doubled my income through its help."

5 Easy Ways to make \$3.00 an hour in Your Spare Time in RADIO



EACH of these plans, developed by the Radio Association of America, is a big money-maker. Set owners everywhere want to get rid of static, to have their sets operate from the electric light socket, the tone improved, and the volume increased, and transformed into single-dial controls. Phonograph owners want their machines electrified and radiofied. If you learn to render these services, you can easily make \$3.00 an hour for your spare time, to say nothing of the money you can make installing, servicing, repairing, building radio sets, and selling supplies.

Over \$600,000,000 is being spent yearly for sets, supplies, service. You can get your share of this business and, at the same time, fit yourself for the big-pay opportunities in Radio by joining the Association.

Join the Radio Association of America

A membership in the Association offers you the easiest way into Radio. It will enable you to earn \$3.00 an hour upwards in your spare time—train you to install, repair, and build all kinds of sets—start you in business without capital or finance an invention—train you for the \$3,000 to \$10,000 big-pay radio positions—help secure a better position at bigger pay for you. *A membership need not cost you a cent!*

The Association will give you a comprehensive, practical, and theoretical training and the benefit of our Employment Service. You earn while you learn. Our cooperative plan will make it possible for you to establish a radio store. You have the privilege of buying radio supplies at wholesale from the very first.

ACT NOW—If you wish No-Cost Membership Plan

To a limited number of ambitious men, we will give Special Memberships that may not—need not—cost you a cent. To secure one, write today. We will send you details and also our book, "Your Opportunity in the Radio Industry." It will open your eyes to the money-making possibilities of Radio.

MAIL THIS COUPON NOW

RADIO ASSOCIATION OF AMERICA
Dept. RCB11, 4513 Ravenswood Ave., Chicago, Ill.

Gentlemen: Please send me by return mail full details of your Special Membership Plan, and also copy of your book, "Your Opportunity in the Radio Industry."

Name.....

Address.....

City..... State.....

WNBK

1310 kc, Knoxville, Tenn., Lonsdale Baptist Church, 50 w, C.

WNBO

1200 kc, Washington, Pa., John Brownlee Spriggs, 15 w, E, "The Voice of Washington, Pa."

WNBQ

1500 kc, Rochester, N. Y., Gordon P. Brown, 15 w, E.

WNBR

1430 kc, Memphis, Tenn., John Ulrich, 500 w, C. Shared.

WNBW

1200 kc, Carbondale, Pa., Home Cut Glass & China Co., 5 w, E.

WNBX

1200 kc, Springfield, Vt., First Congregational Church, Inc., 10 w, E. Shared.

WNBZ

1290 kc, Saranac Lake, N. Y., Smith & Mace, 10 w, daytime, E.

WNEW

1310 kc, Newport News, Va., Virginia Broadcasting Co., Inc., 100 w, E.

WNJ

1450 kc, Newark, N. J., Radio Investment Co., 250 w, E, shared, "The Voice of Newark."

WNOX

560 kc, Knoxville, Tenn., People's Tel. & Tel. Co., 1000 w, C, shared, "Smoky Mountain Station."

WNRC

1440 kc, Greensboro, N. C., Wayne M. Nelson, 500 w, E.

WNYC

570 kc, New York, N. Y., Department of Plant & Structures, 500 w, E, shared, "Municipal Broadcasting Station of the City of New York."

WOAI

1190 kc, San Antonio, Texas, Southern Equipment Co., 5000 w, C, shared, "The Winter Playground of America."

WOAN

600 kc, Lawrenceburg, Tenn., Church of the Nazarene & Vaughan School of Music, 500 w, C, shared, "Watch Our Annual Normal."

WOAX

1280 kc, Trenton, N. J., Franklyn J. Wolff, 500 w, E, shared, "Trenton Makes, the World Takes."

WOBT

1310 kc, Union City, Tenn., Titsworth's Radio & Music Shop, 15 w, C.

WOBU

580 kc, Charleston, W. Va., Charleston Radio Broadcasting Co., 250 w, E. Shared.

WOC

1000 kc, Davenport, Iowa, Palmer School of Chiropractic, 5000 w, C. Shared.

WOCL

1210 kc, Jamestown, N. Y., A. E. Newton, 25 w, E.

WODA

1250 kc, Paterson, N. J., Richard E. O'Dea, 1000 w, E, "The Voice of the Silk City."

WOI

560 kc, Ames, Iowa, Iowa State College, 5000 w, C. Shared.

WOKO

1440 kc, Peekskill, N. Y., Harold E. Smith, 500 w, E. Shared.

WOMT

1210 kc, Manitowoc, Wis., Mikado Theater, 100 w.

WOO

1500 kc, Philadelphia, Pa., John Wanamaker, 100 w, E.

WOOD

1270 kc, Farnwood, Mich., Walter B. Stiles, Inc., 500 w, C, shared, "The Voice of the Whispering Pines."

WOQ

610 kc, Kansas City, Mo., Unity School of Christianity, 1000 w, C. Shared.

WOR

710 kc, Kearny, N. J., L. Bamberger & Co., 5000 w, E.

WORD

1480 kc, Batavia, Ill., People's Pulpit Association, 5000 w, C, shared, "The Watch Tower—Radio WORD."

WOS

630 kc, Jefferson City, Mo., State Marketing Bureau, 500 w, C, shared, "Watch Our State."

WOV

1130 kc, New York, N. Y., International Broadcasting Corp., 1000 w, E.

WOW

590 kc, Omaha, Neb., Woodmen of the World, 1000 w, C, shared, "The Omaha Station."

WOWO

1160 kc, Ft. Wayne, Ind., Main Auto Supply Co., 5000 w, C. Shared.

WPAP

1010 kc, Cliffside, N. J., Calvary Baptist Church, 250 w, E.

WPCC

570 kc, Chicago, Ill., North Shore Congregational Church, 500 w, C. Shared.

WPCH

810 kc, New York, N. Y., Concourse Radio Corp., 500 w.

WPG

1100 kc, Atlantic City, N. J., Municipality of Atlantic City, 5000 w, E. Shared.

WPOR

780 kc, Norfolk, Va., Reliance Electric Co., Inc., 500 w, E. Shared.

WPRC

1200 kc, Harrisburg, Pa., Wilson Printing & Radio Co., 100 w, E.

WPSC

1230 kc, State College, Pa., Pennsylvania State College, 500 w, day, E, "The Voice of the Nittany Lion."

WPSW

1500 kc, Philadelphia, Pa., Philadelphia School of Wireless Telegraphy, 50 w, E, "First Wireless School in America."

WPTF

680 kc, Raleigh, N. C., Durham Life Insurance Co., 10,000 w, E. Shared.

WQAM

1240 kc, Miami, Fla., Electrical Equipment Co., 750 w, E. Shared.

WQAN

880 kc, Scranton, Pa., Scranton Times, 250 w, E. Shared.

WQBC

1360 kc, Utica, Miss., Utica Chamber of Commerce, 300 w, C.

WQBJ

1200 kc, Clarksburg, W. Va., John Raikes, 65 w, E.

WQBZ

1420 kc, Vierton, W. Va., J. H. Thompson, 60 w, E.

WRAF

1200 kc, La Porte, Ind., The Radio Club, Inc., 100 w. Shared.

WRAC

1370 kc, C. R. Cummins, Erie, Pa., 50 w, E.

WRAP

1310 kc, Reading, Pa., Avenue Radio & Electric Shop, 100 w, E, "The Schuylkill Valley Echo."

WRAX

1420 kc, Philadelphia, Pa., Berachah Church, Inc., 250 w, E.

WRBC

1240 kc, Valparaiso, Ind., Immanuel Lutheran Church, 250 w, C, "World Redeemed by Christ."

WRBI

1310 kc, Tifton, Ga., Kent's Furniture & Music Store, 100 w, E. Shared.

WRBJ

1500 kc, Hattiesburg, Miss., Woodruff Furniture Co., 100 w, C.

WRBL

1200 kc, Columbus, Ga., Roy E. Martin, 50 w, E.

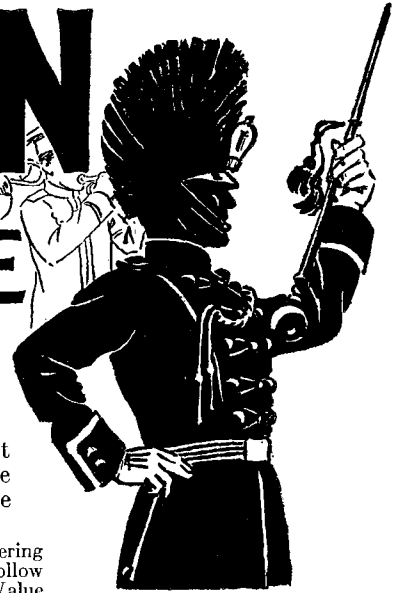
WRBQ

1210 kc, Greenville, Miss., J. Pat Scully, 100 w, C.

WRBT

1370 kc, Wilmington, N. C., Wilmington Radio Association, 50 w, E.

Tyrman AGAIN LEADS THE PARADE

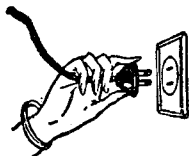


ONCE again Tyrman leads. A year ago Tyrman engineers introduced the Shielded Grid principle in radio circuits. Now they introduce Complete A-C Operation using Shielded Grid Tubes.

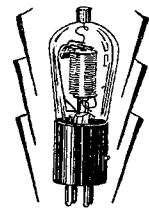
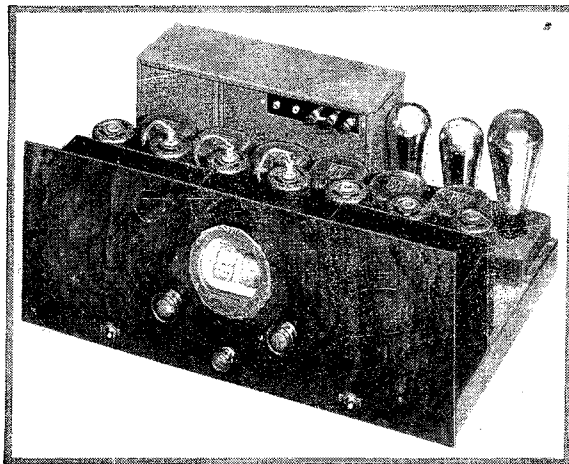
Today finds progressive manufacturers adopting the Shielded Grid principle as originated by Tyrman. We recount this, not in a boastful spirit, but because it definitely indicates Tyrman's engineering leadership, and because it impresses the fact that the Shielded Grid principle as pioneered by Tyrman is recognized as the outstanding advance toward better radio reception.

In this new series of Custom Built Receivers, Tyrman engineers contribute new engineering leadership in design, performance and refinement that again sets the pace for manufacturers to follow as best they can. You will find in Tyrman Custom Built Receivers, Performance, Beauty and Value not approached in other receivers today. Send for free booklet and prove it to your own satisfaction.

NOW! Shielded Grid A-C-Complete Socket Operation



A-C operation in the full sense of its meaning. The Power Supply is designed solely for the Tyrman Imperial "80." Tyrman ingenuity places it on sub-panel with other parts as an integral part of the chassis. Factory assembled, no adjustments. Dynamic speaker filament can be energized directly from the "80" Power Supply. An outstanding feature. Any type of speaker can be used.



Before offering Tyrman A-C Shielded Grid Receivers, the A-C Shielded Tubes were subjected to months of rigid tests. It has practically the same inter-element capacity as the direct current type. Tests for life, heater emission, change, plate impedance characteristics and amplification prove the absolute efficiency of A-C Shielded Grid Tubes.

Tyrman Imperial "80" Custom-Bilt Shielded Grid



CHECK THE FEATURES

Designed for those who want the finest in A-C Socket Operated Receivers. The actual performance of the "80" is defined by a practically positive 10 K.C. selectivity over entire broadcast wave band without sacrifice of volume. Plug-in coils for short waves. Superior tone quality through use of CX350 or 310 amplifier tube. Unequaled stability—Sensitivity. Permanent phonograph connection. One-spot—Non-oscillation. Adjustable to antenna. No critical adjust-

ments. Individual in appearance and beauty. Panel only 8 x 21" of genuine wood-walnut impressed on steel. New Tyrman Worm Drive Illuminated Drum. Heavy steel sub-panel Cadmium plated. Special precision-made parts. The Imperial "80" uses (3) A-C Shielded Grid tubes, (4) 327 tubes, (1) 350 or 310 tube and (2) 381 tubes. Complete parts and Power Sup- \$199.50
ply factory packed ready to assemble.

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Chicago, Illinois

Without obligation send me FREE book describing "80" Tyrman Custom Built Receiver.

Name

Address

My jobber is

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

WRBU

1210 kc, Gastonia, N. C., A. J. Kirby Music Co., 50 w, E.

WRBW

1310 kc, Columbia, S. C., Paul S. Pearce, 15 w, E.

WRBX

930 kc, Roanoke, Va., Grace Covenant Presbyterian Church, 250 w, E. Shared.

WRC

930 kc, Washington, D. C., Radio Corporation of America, 500 w, E, "The Voice of the Capital."

WREC

600 kc, Whitehaven, Tenn., WREC, Inc., 500 w. Shared.

WREN

1220 kc, Lawrence, Kan., Jenny Wren Co., 1000 w, C. Shared.

WRHF

1270 kc, Washington, D. C., American Broadcasting Co., 150 w, daytime, E.

WRHM

1250 kc, Fridley, Minn., Rosedale Hospital Co., Inc., 1000 w, C, shared, "Welcome Rosedale Hospital, Minneapolis."

WRJN

1210 kc, Racine, Wis., Racine Broadcasting Corp., 100 w, C. Shared.

WRK

1310 kc, Hamilton, Ohio, S. W. Doron & John C. Slade, 100 w, E, "The Voice of Hamilton."

WRM

570 kc, Urbana, Ill., University of Illinois, 500 w, C. Shared.

WRNY

1450 kc, New York, N. Y., Experimenter Pub. Co., 250 w, E. Shared.

WRR

1190 kc, Dallas, Texas, City of Dallas, 5000 w, C. Shared.

WRUF

1470 kc, Gainesville, Fla., University of Florida, 5000 w, E. Shared.

WRVA

1110 kc, Richmond, Va., Larus Bros. & Co., Inc., 5000 w, E, "Carry Me Back to Old Virginy."

WSAI

800 kc, Mason, Ohio, Crosley Radio Corp., 5000 w, E, shared, "The Gateway to Dixie."

WSAJ

1310 kc, Grove City, Pa., Grove City College, 100 w, E.

WSAN

1500 kc, Allentown, Pa., Allentown Call Pub. Co., 100 w, E, shared, "We Serve Allentown Nationality."

WSAR

1450 kc, Fall River, Mass., Doughty & Welch Electrical Co., Inc., 250 w, E. Shared.

WSAZ

580 kc, Huntington, W. Va., McKellar Electric Co., 250 w, E. Shared.

WSB

740 kc, Atlanta, Ga, Atlanta Journal Co., 1000 w, E, "The Voice of the South."

WSBC

1210 kc, Chicago, Ill., World Battery Co., Inc., 100 w. Shared.

WSBT

1230 kc, South Bend, Ind., South Bend Tribune, 500 w, C. Shared.

WSDA

1400 kc, Brooklyn, N. Y., Amateur Radio Specialty Co., 500 w. Shared.

WSEA

780 kc, Portsmouth, Va., Virginia Beach Broadcasting Co., Inc., 500 w, E, shared, "The Voice of Tidewater Virginy."

WSIX

1210 kc, Springfield, Tenn., 638 Tire & Vulcanizing Co., 100 w, C.

WSKC

1410 kc, Bay City, Mich., World's Star Knitting Co., 500 w, E, "Where the Summer Trail Begins."

WSM

650 kc, Nashville, Tenn., National Life & Accident Ins. Co., 5000 w, C, "We Shield Millions."

WSMB

1320 kc, New Orleans, La., Saenger Theaters, Inc., & Maison Blanche Co., 750 w, C, "America's Most Interesting City."

WSMK

570 kc, Dayton, Ohio, Stanley M. Krohn, Jr., 200 w, C, "The Home of Aviation."

WSPD

1340 kc, Toledo, Ohio, Toledo Broadcasting Co., 500 w, E. Shared.

WSRO

1420 kc, Middletown, Ohio, Harry W. Fahrlander, 100 w, C, "We Sell Radio Only."

WSSH

1420 kc, Boston, Mass., Tremont Temple Baptist Church, 100 w, E, shared, "Stranger's Sunday Home."

WSUI

580 kc, Iowa City, Iowa, State Univ. of Iowa, 500 w, C, shared, "The Old Gold Studio."

WSUN

900 kc, St. Petersburg, Fla., St. Petersburg Chamber of Commerce, 1000 w, E, shared, "St. Petersburg, the Sunshine City."

WSVS

1370 kc, Buffalo, N. Y., Seneca Vocational School, 50 w, E, "Watch Seneca Vocational School."

WSYR

570 kc, Syracuse, N. Y., Olive B. Merewith, 250 w, E. Shared.

WTAD

1440 kc, Quincy, Ill., Illinois Stock Medicine Broadcasting Corp., 500 w. Shared.

WTAG

580 kc, Worcester, Mass., Worcester Telegram Pub. Co., Inc., 250 w, E, "The Voice From the Heart of the Commonwealth."

WTAM

1070 kc, Cleveland, Ohio, WTAM & WEAR, Inc., 3500 w, E, shared, "The Voice From the Storage Battery."

WTAQ

1330 kc, Eau Claire, Wis., Clyde S. Van Gordon, 1000 w, C. Shared.

WTAW

1120 kc, College Station, Texas, Agri. & Mech. College of Texas, 500 w, C. Shared.

WTAX

1210 kc, Streator, Ill., Williams Hardware Co., 50 w. Shared.

WTAZ

1210 kc, Richmond, Va., W. Reynolds, Jr., and T. J. McGuire, 14 w.

WTFF

1460 kc, Mt. Vernon Hills, Va., Independent Pub. Co., 10,000 w.

WTFI

1450 kc, Toccoa, Ga., Toccoa Falls Institute, 500 w, E.

WTHS

1310 kc, Atlanta, Ga., Atlanta Technological High School, 20 w, C. Shared.

WTIC

1060 kc, Hartford, Conn., Travelers Insurance Co., 50,000 w, E, shared, "The Insurance City."

WTMJ

570 kc, Milwaukee Journal, Brookfield, Wis., 1000 w, C. Shared.

WWAE

1200 kc, Hammond, Ind., Dr. Geo. F. Courier, 10 w.

WWJ

920 kc, Detroit, Mich., The Detroit News, 1000 w, E.

WWL

850 kc, New Orleans, La., Loyola University, 5000 w, C. Shared.

WWNC

570 kc, Asheville, N. C., Chamber of Commerce, 1000 w, E.

WWRL

1500 kc, Woodside, N. Y., Wm. H. Rouman, 100 w. Shared.

WWVA

1160 kc, Wheeling, W. Va., John C. Stroebel, Jr., 5000 w, E. Shared.

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U. S. Broadcasting Stations Listed by States

ALABAMA

Auburn, WAPI
Birmingham, WBRB, WKBC
Gadsden, WJBY
Montgomery, WIBZ

ALASKA

Anchorage, KFQD
Juneau, KFJU
Ketchikan, KGBU

ARIZONA

Flagstaff, KFXY
Phoenix, KFAD, KFBC
Prescott, KPJM
Tucson, KGAR

ARKANSAS

Blytheville, KLON
Fayetteville, KUOA
Hot Springs, KTHS
Little Rock, KLRN, KGLI,
KGJ
McGehee, KGHG
Sulphur Springs, KFPW

CALIFORNIA

Avalon, KFWO
Berkeley, KRE
Beverly Hills, KEJK
Burbank, KELV
Culver City, KFVD
El Centro, KGEN
Fresno, KMMJ
Glendale, KGFH
Hayward, KZM
Hollywood, KFQZ, KMTR,
KXN, KFVB
Holy City, KFQJ
Inglewood, KMG
Long Beach, KPON, KGER
Los Angeles, KEJK, KFI,
KFSG, KGEF, KGFJ, KHJ,
KPLA, KFI
Oakland, KFTW, KGO, KLS,
KLN, KTVB
Ontario, KFVC
Pasadena, KPIC, KPSN
Sacramento, KPRK
San Diego, KFSD, KGB
San Francisco, KFRC, KFWI,
KGT, KJBS, KPO, KYA
San Jose, KQW
Santa Ana, KWTC
Santa Barbara, KFBR
Santa Maria, KSMR
Santa Monica, KNRC
Stockton, KGDM, KWC

COLORADO

Colorado Springs, KFUM
Denver, KFEL, KFUP, KFXF,
KOA, KOW, KPXP
Durant, KIZ
Edgewater, KEXJ
Fort Morgan, KGEW
Greely, KFKA
Gunnison, KPFA
Pueblo, KGPB, KHGF, KGHX,
KYUN, KGEK

CONNECTICUT

Easton, WICC
Hartford, WVIC
New Haven, WDRB
Storrs, WCAE

DISTRICT OF COLUMBIA

Washington, NAA, WMAL,
WRC, WRHF

FLORIDA

Clearwater, WFLA
Gainesville, WRUF
Jacksonville, WJAX
Lakeland, WMLI
Miami Beach, WIOD, WMBF,
WQAM
Orlando, WDBO
Pensacola, WCOA
Sarasota, WJBB
St. Petersburg, WSUN
Tampa, WDAE, WMBR

GEORGIA

Atlanta, WGST, WSB, WTHS
Columbus, WRBL
Macon, WMAZ
Tifton, WRBI
Toccoa, WTFI

HAWAII

Honolulu, KGHB, KGU

IDAHO

Boise, KPAV
Jerome, KFXD
Kellogg, KLEY
Pocatello, KSEI

ILLINOIS

Addison, WMBI
Batavia, WORD
Carthage, WCAZ
Chicago, KYIV, WAAF,
WCFL, WCRW, WEDC,
WENT, WGES, WFPC,
WBEI, WTCO, WSBC
Cretz, WLS
Decatur, WRBO, WJBL
Deerfield, WHT
Des Plaines, WIBO
Elin. WGN
Elmhurst, WMAQ
Evanston, WEHS
Galesburg, WLBO
Glenview, WBBM
Harrisburg, WEHQ
Joliet, WCLS, WKBB
La Salle, WJBC
Mooseheart, WJJD
Mt. Prospect, WJAZ
Peoria Heights, WMBD
Quincy, WTAD
Rockford, KFI.V
Rock Island, WHBF
Springfield, WGBS
Streator, WTAX,
Tuscola, WJZ
Urbana, WRM
Zion, WCBD

INDIANA

Anderson, WHBU
Bloomington, WKRV
Crown Point, WLBT
Culver, WCMA
Evansville, WGBF
Fort Wayne, WCVK, WOWO
Gary, WJRS
Hammond, WVAE
Indianapolis, WFBI, WKBF
Kokomo, WJAK
La Porte, WRAF
Muncie, WLBO
South Bend, WSRT
Terre Haute, WBOW
Valparaiso, WRBC
Lafayette, WBAA

IOWA

Ames, WOI
Boone, KFQO
Cedar Rapids, KWCR
Clarinda, KSO
Council Bluffs, KOIL
Des Moines, WOI
Decorah, KGCA, KWLO
Des Moines, WHO
Ft. Dodge, KFTY
Iowa City, WSUI
Marshalltown, KFJB
Muscatine, KTNT
Ottumwa, WIAS
Red Oak, KICK
Shenandoah, KPWF, KMA
Stour City, KSCJ
Waterloo, WJAM

KANSAS

Concordia, KGCN
Lawrence, KFJU, WREN
Manhattan, KSAO
Milford, KFRB
Topeka, WIPW
Wichita, KFH

KENTUCKY

Hopkinsville, WFTW
Louisville, WHAS, WLAP

LOUISIANA

Cedar Grove, KGGH
Kennonwood, KWKH
New Orleans, WABZ, WCBE,
WJBO, WJWB, WKBT,
WSMR, WWL, WDSU
Shreveport, KFDD, KSBA,
KWEA, KRMD

MAINE

Rangor, WABI
Dover-Foxcroft, WLBZ
Portland, WBSH

MARYLAND

Baltimore, WCAO, WCBM,
WFBR
Glen Morris, WRAL
Salisbury, WBES

MASSACHUSETTS

Boston, WBIS, WRZA, WFEL,
WNAO, WLOS, WSSH, WNES
Chelsea, WLO
Dartmouth, WMAF
East Springfield, WBSZ
Fall River, WSAR
Gloucester, WEPS
Lexington, WLEX
Medford, WEET
New Bedford, WNBH

MICHIGAN

Battle Creek, WKBP
Bay City, WSKC
Berrien Springs, WEMC
Detroit, WAFD, WBMH,
WMBE, WWJ
East Lansing, WKAR
Flint, WFDD
Fraser, WGHF
Fruwood, WOOD
Grand Rapids, WASH
Jackson, WJEM
Lapeer, WMPU
Ludington, WKBB
Pontiac, WCX
Royal Oak, WAGM
Ypsilanti, WJBK

MINNESOTA

Anoka, WCCO
Barrett, KGGI
Collegeville, WFBJ
Fridley, WRHM
Hallock, KGFK
Minneapolis, WDMY, WDCS,
WHDL, WLB
Northfield, KFMY, WCAL
Westcott, KSTP

MISSISSIPPI

Columbus, WCOG
Greenville, WRRQ
Gulfport, WGCN
Hattiesburg, WRBZ
Utica, WQBC

MISSOURI

Cape Girardeau, KFVS
Clayton, KFUO
Columbia, KFJZ
Independence, KLDS, KMBC
Jefferson City, WOS
Joplin, WMBH
Kansas City, KWKC, WDAF,
WVB, WLRF, WOQ
Kirksville, KFKZ
Kirkswood, KMOX
St. Joseph, KGRN, KFEO
St. Louis, KFEF, KSD,
KWK, WEW, WIL, WMLY

MONTANA

Billings, KGHF
Haystack, KPIB
Kalispell, KGEZ
Missoula, KPOM, KGHF
Vida, KGX

NEBRASKA

Clay Center, KMMJ
Lincoln, KFAB, KFOR, WCAJ
Norfolk, WJAG
Omaha, WVAW, WOW
Ravenna, KGFV
York, KGBZ

NEW HAMPSHIRE

Laconia, WKAV
Tilton, WBRL

NEW JERSEY

Asbury Park, WCAP
Atlantic City, WPG
Camden, WCAM
Cliffside, WJAP
Hoboken, WMCA, WPCH
Jersey City, WAAT, WKRO
Kearney, WLWL, WOR
Newark, WAAM, WGCP,
WNJ
Paterson, WODA
Red Bank, WBEI
Secaucus, WOV
Union City, WBMS
Trenton, WOAX

NEW MEXICO

Albuquerque, KGGM
Raton, KGFL
State College, KOB

NEW YORK

Astoria, WGRS
Auburn, WMBQ
Bay Shore, WNRB
Bellmore, WEAF
Bronx, WHPP
Brooklyn, WBBC, WSDA,
WLIH, WJBO, WSGH
Buffalo, WBER, WGR,
WKBW, WKBN, WSVS
Canton, WCAD
Canenovia, WMAC
Coney Island, WCGU
Enfield, WNBC

FLORIDA

Farmingdale, WLHB
Freeport, WGBB
Greenville, WGOH
Ithaca, WLGI
Jamaica, WMRJ
Jamestown, WOOL
Lockport, WMAK
Long Beach, WCLE
Long Island City, WLBB
New York, WBNY, WHN,
WJZ, WKBO, WMCA,
WNSG, WNYC, WPCB,
WRNY, WRU
Peekskill, WOKO
Rochester, WARQ, WHAM,
WHEC, WNBQ
Rossville, WBBR
Saratoga Lake, WNBZ
Schenectady, WGY
Syracuse, WFBL, WSYR
Troy, WHAZ
Utica, WIBX
Woodhaven, WEVD
Woodside, WVRL

NORTH CAROLINA

Asheville, WUNC
Charlotte, WBT
Gastonia, WRBT
Greensboro, WNRC
High, WPTF
Wilmington, WRBT

NORTH DAKOTA

Bismarck, KFYZ
Devils Lake, KDRL
Fargo, WDAY
Grand Forks, KFJM
Mandan, KGOU

OHIO

Akron, WADC, WFIC
Bellevue, WBBB
Canton, WBR
Cincinnati, WERE
Cincinnati, WVAZ, WFBE,
WKRC, WUW
Cleveland, WPAR, WHK,
WJAX, WTAM
Columbus, WUAB, WCAH,
WEA, WMAN
Dayton, WSMK
Hamilton, WRK
Mansfield, WLBY
Mason, WSAI
Middleton, WSBO
Springfield, WCSO
Steubenville, WBRB
Toledo, WSPD
Youngstown, WKBN

OKLAHOMA

Alva, KGEF
Chickasha, KOCW
Norman, WNAD
Oklahoma City, KFJE, KFZR,
KGCB, KGFV, WKY
Picher, KGGP
Ponca City, WBBZ
Tulsa, KV00

OREGON

Astoria, KFJI
Corvallis, KOAC
Eugene, KORB
Medford, KMBE
Portland, KEX, KFF,
KFP, KFR, KGW,
KTR, KWBS, KWJJ,
KXJ
Sylvan, KOIN

PENNSYLVANIA

Allentown, WCBF, WSN
Altoona, WBBG
Carbondale, WNBW
East Pittsburgh, KDKA
Elkins Park, WIRG
Erie, WEDH, WRBK
Frankford, WPKD
Greene City, WSAJ
Harrisburg, WBAL, WPRC
Johnstown, WHRP
Kingston, WABF
Lancaster, WCAE, WEJC
Le Moyne, WMBE
Lewisburg, WJBU
Oil City, WLBY
Philadelphia, WARY, WCAU,
WF, WHRW, WIAD, WIP,
WLIT, WNAU, WOP,
WRAX, WPSW, WPAN
Pittsburgh, KQV, WCAE,
WJAS
Reading, WRAW
Scranton, WGRI, WQAN,
State College, WPCB
Wilkes-Barre, WRBY, WBRF
Willow Grove, WALK
Washington, WNBO

PORTO RICO

San Juan, WKAQ

RHODE ISLAND

Cranston, WDFW, WLSI
Newport, WMBR
Pawtucket, WFBI
Providence, WEAN, WJAR

SOUTH CAROLINA

Charleston, WBBY
Columbia, WBBW

SOUTH DAKOTA

Brookings, KFDT, KGOR
Dell Rapids, KGDA
Pierre, KGFX
Rapid City, WCAT
Sioux Falls, KSOO
Vermillion, KUSD
Yankton, KNAX

TENNESSEE

Chattanooga, WDOD
Knoxville, WFBC, WNBZ,
WNX
Lawrenceburg, WOAN
Memphis, WGBC, WBBQ,
WMBL, WMC, WNBK
Nashville, WBAW, WLAC,
WSPN
Springfield, WSIX
Union City, WOBT
White Haven, WREO

TEXAS

Amarillo, KGRS, WDAG
Austin, KUT
Beaumont, KFDM
Breckenridge, KFYO
Brownsville, KVVW
College Station, WTAW
Dallas, KRLL, WFAA, WRR,
Dublin, KPPL
El Paso, WDAH
Forth Worth, KFJZ, KFQB,
WJAF
Galveston, KFLX, KFUL
Georgetown, KGKL
Goldsmith, KGKB
Greenville, KFPM
Harlingen, KRGV
Houston, KTRC, KTUE
Richardson, KGHX
San Angelo, KQPI
San Antonio, KGCI, KGDR,
KTAT, KTSA,
WQAI
Waco, WJAD
Wichita Falls, KGKO

UTAH

Odgen, KFUR
Salt Lake City, KDYL, KSL

VERMONT

Burlington, WCAE
Springfield, WNBX

VIRGINIA

Arlington, NAA
Chesapeake Hills, WTAZ
Mt. Vernon Hills, WFFF
Newport News, WNEW
Norfolk, WBBW, WPOB,
WTAR
Petersburg, WLBB
Portsmouth, WSEA
Richmond, WBLB, WMBG,
WRYA
Roanoke, WDBJ, WRBX

WASHINGTON

Aberdeen, KNRO
Bellingham, KVOS
Everett, KPBL
Lacey, KGY
Longview, KIJJ
Pullman, KWSC
Seattle, KFOA
KQO, KJR, KKP, KMO,
KPJB, KRSC, KTW, KVL,
KXA
Spokane, KFTO, KFPY, KGA,
KHQ
Tacoma, KMO, KVI

WEST VIRGINIA

Clarksburg, WQBJ
Charleston, WOBU
Huntington, WSAZ
Martinsburg, WBOB
Wheeling, WVVV

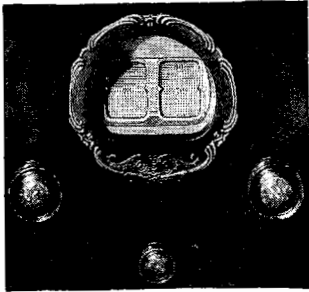
WISCONSIN

Appleton, WAIZ
Beloit, WERV
Brookfield, WTMJ
Eau Claire, WTAQ
Fond Du Lac, KFIZ
Kenosha, WCLG
La Crosse, WLBH
Madison, WHA, WIBA
Manitowac, WOMET
Milwaukee, WGWB, WHAD,
WISN
Portage, WIRU
Racine, WRIJ
Sheboygan, WHBL
Stevens Point, WLBB
Superior, WEBC
West De Pere, WHBY

WYOMING

Laramie, KFBU

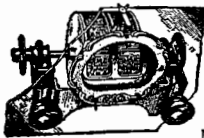
TYRMAN
Laboratory Tested
PRODUCTS



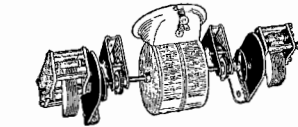
Tyrman Illuminated Worm Drive Double Drum

Isn't this a good looking dial? Just as efficient as it is good looking, too. Universal in its application. Condensers fit without filing or sawing. Worm Gear Drive—positive and sure in action. Insulated mounting is provided for condensers, also insulated coupling disk which prevents body capacity. Translucent window reflector provides indirect illumination on the dials.

The Tyrman Worm Drive Double Drum comes completely assembled. You need only to connect your tuning condenser by fastening set screws. Includes two matched knobs for tuning, one for volume control. Complete only \$12.00.



Cut away front view of Tyrman double drum dial showing how it looks when mounted on panel. Volume control knob not shown.



Rear view of the Tyrman Double Drum Dial ready to mount.

Tyrman Illuminated Single Drum Dial



The same general design of the Double Drum except knob for volume is on the left so only two knobs are needed. Packed complete with two matched knobs, price only \$8.00.

Tyrman Shielded Socket Automatically Grounded



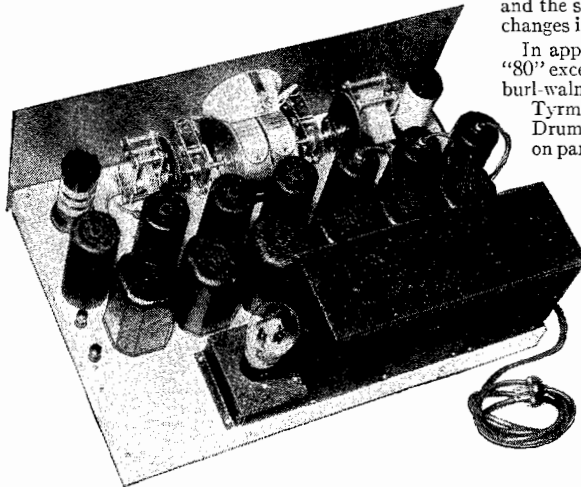
An advanced and perfected design of shielded Socket with an automatic contact for grounding shield when used with Shield Grid Tubes. Ventilated and built of heavy aluminum. Readily dissipates heat generated by the filament of new heater type A. C. tubes. Of utmost importance considering reaction of heat on the neighboring R. F. apparatus. Type 2-26 for four prong tubes or Type 2-27 for five prong heater type tubes, complete with Socket and Shield—Price \$1.25.

This New 2-Way Design AGAIN Proves Tyrman Leadership

The Tyrman "72" is a "two-way" Receiver. Completely assembled for either A-C or Battery operation. In line with the Tyrman principles of design, the "72" is not merely adaptable to A-C operation but when assembled for A-C, it is completely socket operated using A-C Shielded Grid and A-C tubes with Power Supply mounted on sub-panel platform as an integral part of the chassis. Power Supply especially designed for the "72" circuit. In circuit design, the "72" closely follows the "80," embodying many of its features. Distance, Selectivity, Stability and Sensitivity comparable only to the "80."

Tyrman "72" Custom-Built Shielded Grid

The "72" provides an advance Shielded Grid Receiver for those who wish to keep their present batteries or eliminators, or for localities where A-C power is not available. Even if assembled as a battery operated set, it is a simple matter to convert it to complete A-C operation by merely changing a few parts and the sockets for A-C tubes and making a few changes in the wiring scheme.



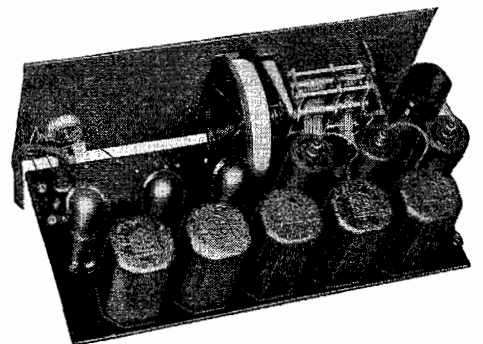
In appearance the "72" closely resembles the "80" except that the front panel is of metal with burl-walnut finish. It is equipped with the new Tyrman Illuminated Double Worm Drive Drum. 110 A-C switch and phonograph jack on panel. Easily and quickly assembled. Like the "80," all parts for the "72" are special and built to rigid specifications to assure uniformity. All parts packed complete at factory ready for assembly.

The Tyrman "72" when assembled for A-C operation uses (3) A-C Shielded Grid tubes, (1) 371 tube, (3) 327 tubes and (1) 380 tube in Power Pack. Complete parts for A-C or battery operation packed, ready to assemble. **\$98.50** List Price.
"72" Power Pack for A-C operation, factory assembled \$5.75. Complete Set of 4 short wave. **\$10.00** List Price.

AMERICA'S BIGGEST VALUE!

Tyrman '60' Custom-Built Shielded Grid

The Tyrman "60" is designed for Battery or Eliminator Operation. Uses Shielded Grid tubes, Type 222. Combines many of the features of the famous Tyrman "70". Like all Tyrman Shielded Grid Receivers, the "60" circuit is designed especially for Shielded Grid tubes, assuring efficient use of the enormous amplifications of the tubes. Panel only 7"x18" equipped with Tyrman Single Vernier Drum Dial. For Appearance, Tone Quality, Distance, Selectivity, Sensitivity and Stability, the Tyrman "60" is comparable only to other Tyrman Shielded Grid Receivers. Set Builders tell us it is the biggest value for a high grade receiver in the country today. Parts complete packed, ready to assemble. **\$69.50** List Price.



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Chicago, Illinois

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Name.....
Address.....
My jobber is.....



Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

U. S. Broadcasting Stations by Frequencies

550 Kilocycles, 545.1 Meters:
KFPO, KSD, WGR, WEAQ, KFJR, KFJM, WKRC, KFDY

560 Kilocycles, 535.4 Meters.
KLZ, WFLA, WSUN, WMBF, WFI, WLIT, WNOX, WOI, KFDM, KFEO, KOAC

570 Kilocycles, 526.0 Meters:
KMTR, KPLA, WMCA, WWNG, WSMK, KVOS, KXA, WTMJ, WHA, WNYC, WPCQ, WKBW, WRM, WSYR, KUOM

580 Kilocycles, 516.9 Meters—Canadian Shared:
WTAG, WKAQ, KGFX, WOBW, WSAZ, WSUL, KSAC

590 Kilocycles, 508.2 Meters:
WEEI, WCAJ, WOW, KHQ

600 Kilocycles, 499.7 Meters—Canadian Shared:
KFSD, WCAO, WOAN, WREC, WEBW, KFBW

610 Kilocycles, 491.5 Meters:
KFRC, WDAF, WOQ, WFAN, WIP

620 Kilocycles, 483.6 Meters:
KFAD, WDBO, WDAE, WLBZ, KGW

630 Kilocycles, 475.9 Meters—Canadian Shared:
WMAL, WGBF, KFRU, WOS

640 Kilocycles, 468.5 Meters:
KFI, WAIU

650 Kilocycles, 461.3 Meters:
WSM

660 Kilocycles, 454.3 Meters:
WAAW, WEAJ, WJZ

670 Kilocycles, 447.5 Meters:
WMAQ

680 Kilocycles, 440.9 Meters:
KPO, WEMC, WPTF

690 Kilocycles, 434.5 Meters—Canadian Wave:

700 Kilocycles, 428.3 Meters:
KFVD, WLW,

710 Kilocycles, 422.3 Meters:
WOR

720 Kilocycles, 416.4 Meters:
WGN

730 Kilocycles, 410.7 Meters—Canadian Wave:

740 Kilocycles, 405.2 Meters:
WSB, KMMJ

750 Kilocycles, 399.8 Meters:
WCX

760 Kilocycles, 394.5 Meters:
WEW

770 Kilocycles, 389.4 Meters:
WBBM, KFAB

780 Kilocycles, 384.4 Meters—Canadian Shared:
KELW, KNRC, WBSO, WMC, WTAR, WPOR, WSEA

790 Kilocycles, 379.5 Meters:
KGO, WGY

800 Kilocycles, 374.8 Meters:
KTHS, WBAP, WSAI

810 Kilocycles, 370.2 Meters:
WCCO, WPCB

820 Kilocycles, 365.6 Meters:
WHAS

830 Kilocycles, 361.2 Meters:
KOA, WJJD

840 Kilocycles, 356.9 Meters—Canadian Wave:

850 Kilocycles, 352.7 Meters:
KFQZ, KWKH, WWL

860 Kilocycles, 348.6 Meters:
WABC

870 Kilocycles, 344.6 Meters:
WENR, WLS

880 Kilocycles, 340.7 Meters—Canadian Shared:
WCOC, WGBI, WQAN, WJAR, KFKA, KLX, KPOF

890 Kilocycles, 336.9 Meters—Canadian Shared:
WGST, WMAZ, KFNF, KUSD, WNAX, WMMN, KGJF

900 Kilocycles, 331.1 Meters:
KHJ, WMAK, WFBL, WKY, WLBL, WFLA, WSUN, WHAD, WGBU, KSEI

910 Kilocycles, 329.5 Meters—Canadian Wave:

920 Kilocycles, 325.9 Meters:
WAAF, WJJD, KOMO, KPRC

930 Kilocycles, 322.4 Meters—Canadian Shared:
WBRC, KFWM, KFVI, KMA, KGBZ, WIBG, WRBX, WDBJ, WRC

940 Kilocycles, 319 Meters:
KGU, WFIW, WCSH, KOIN, KFEL, KFXF

950 Kilocycles, 315.6 Meters:
KFWB, KPSN, KLDS, KMBC, WHB, KBHL, KGH

960 Kilocycles, 312.3 Meters—Canadian Wave:

970 Kilocycles, 309.1 Meters:
KJR, WCFL

980 Kilocycles, 305.9 Meters:
KDKA

990 Kilocycles, 302.8 Meters:
WBZA, WBZ

1000 Kilocycles, 299.8 Meters:
KGFH, WHO, WOC

1010 Kilocycles, 296.9 Meters—Canadian Shared:
KQW, WPAP, WHN, WJBB, WNAD, KGGF

1020 Kilocycles, 293.9 Meters:
KYW

1030 Kilocycles, 291.1 Meters—Canadian Wave:

1040 Kilocycles, 288.3 Meters:
WKAR, KRDL, WFAA, WKEN

1050 Kilocycles, 285.5 Meters:
KNX

1060 Kilocycles, 282.8 Meters:
WTIC, WBAL, WJAG, KWJJ

1070 Kilocycles, 280.2 Meters:
WCAZ, WDZ, WTAM, WEAR, WAAT

1080 Kilocycles, 277.6 Meters:
WBT, WCBD, WMBI

1090 Kilocycles, 275.1 Meters:
KMOX

1100 Kilocycles, 272.6 Meters:
WPG, WLWL, KJBS

1110 Kilocycles, 270.1 Meters:
WRVA, KSOO

1120 Kilocycles, 267.7 Meters—Canadian Shared:
KFQU, KFSG, WCOA, WBAO, WFBR, WBAK, KUT, WTAW, KRSC, WISN

1130 Kilocycles, 265.3 Meters:
KFKB, WOV, KSL

1140 Kilocycles, 263.0 Meters:
WAPI, KVOO

1150 Kilocycles, 260.7 Meters:
KGDM

1160 Kilocycles, 258.5 Meters:
WOWO, WHAM, WEAN, WWVA

1170 Kilocycles, 256.3 Meters:
WCAU, KTNT

1180 Kilocycles, 254.1 Meters:
KOB, WGBS, KEX

1190 Kilocycles, 252.0 Meters:
WRR, WOAI

1200 Kilocycles, 249.9 Meters: Canadian Shared:

KGEN, KMI, KFWC, KPPC, KSMR, KGEW, KFHA, KGEK, WRBL, WJBL, WJBC, WWAE, WRAF, KFJB, WIAM, WLAP, WABZ, WJWV, WABI, WEPS, WKBE, KGDE, KGFK, KFWF, WMAJ, KCCU, WHBC, WFBE, WBBZ, WNBW, WPRC, WNBO, WBBY, KGDY, WCAT, WFBC, WCAJ, WNBX, WBBW, WLBG, WQBJ, WCLO, WRJN, WHBY, WKJC, WIBX, KFKZ, KWG.

1210 Kilocycles, 247.8 Meters—Canadian Shared:
WJBY, KGDP, WMBR, WCRW, KPCB, WEDC, WSCB, WEBO, WHBF, WCBZ, WTAX, WHBU, WQBC, KFVS, WIBA, KFOR, WJBI, WQMT, WJNR, WGBB, WCOH, WLCL, WOCL, WRBU, KDLR, WBEA, WMAN, WLBV, KGC, WJBU, WBAJ, KGR, WSIX, KFLX, KTAJ, WTAJ, WMBG, KPO, WRBQ, WFCI, KFDX, KWEA, WPCM, KFEY

1220 Kilocycles, 245.6 Meters:
WCAD, WCAE, WREN, KFKU

1230 Kilocycles, 243.8 Meters:
WNAC, WBIS, WLB, WPSC, WCWK, WFBM, WSBT, KFIO, KFQD, KYA

1240 Kilocycles, 241.8 Meters:
WQAM, WIOD, WRBC, KFQB, WJAD, WGHF

1250 Kilocycles, 239.9 Meters:
KEJK, KFON, WAAW, WQCP, WODA, KXL, WCAL, WGMZ, WRHM, KFAU, KFMX

1260 Kilocycles, 238.0 Meters:
KOLL, WLBW, WJAS, WJAX, KRGV, KWVG

1270 Kilocycles, 236.1 Meters:
KTAR, WRHF, KGCA, KWLC, WDSU, WOOD, WASH, KFOA, KFUM, KTW

1280 Kilocycles, 234.2 Meters:
WCAP, WCAM, WOAX, WDAY, WDDO, WEBC, KTAB

1290 Kilocycles, 232.4 Meters:
KLCN, WNBZ, WFUL, KTSA, KDYL, WJAS

1300 Kilocycles, 230.6 Meters:
KEGF, KTBI, WIBW, KFH, WBBR, WHAZ, WEVD, WHAP, KFJR, KTBR

1310 Kilocycles, 228.9 Meters:
WKBC, KFUI, KFCB, KFBK, WMBL, WTHS, WRBL, WHFC, WKBL, WEHS, WKBS, WLBO, WCLS, WKBB, WJAK, WLBC, WBOW, KFGO, KWCR, KFJY, WBEZ, WBMH, WDFE, WMPG, WAGM, KGEZ, WKAJ, WBR, KFXX, WFBG, WFKD, WSAJ, WBBP, WGL, WRK, KRMD, KGGH, KFPL, KGHG, WABY, WIAD, WNAT, WRAW, WBR, WRB, WNB, WBT, WDAH, KFP, KGFI, KGR, WNEW, WBU

1320 Kilocycles, 227.1 Meters:
KGFH, KGH, WSMB, WADC

1330 Kilocycles, 225.4 Meters:
WDR, WCAC, KSCJ, WTAQ

1340 Kilocycles, 223.7 Meters:
KFPW, KMO, KVI, WSPD

1350 Kilocycles, 222.1 Meters:
KWK, WIL, WBNY, WKBQ, WMSG, WCDA

1360 Kilocycles, 220.4 Meters:
WGES, WJCS, WBET, WMAF, WQBC, KFBB, KGB

1370 Kilocycles, 218.8 Meters:
KGA, KZM, KGER, WJO, WCBM, WIBM, WJBK, WFB, KWKC, WMB, WSVS, WRBT, WHBD, KGF, KFII, KFEC, WRAC, WDW, WLSI, WHBO, KFJ, KGKL, KTUE, KWCI, KGKO, WBB, KGD, KGBX, KRE, KGFL, KFUR, KGM

1380 Kilocycles, 217.3 Meters:
KSO, WCO, KQV, WKBH

1390 Kilocycles, 215.7 Meters:
KOW, WHK, KFPY, KLRA, KUOA, KWSC

1400 Kilocycles, 214.2 Meters:
WCM, WKB, WBA, WBB, WLTH, WSGH, WSD, WCGU

1410 Kilocycles, 212.6 Meters:
KFLV, WSKC, WDG, WHDI, KGRS, WDAG, WHBL, WDEL

1420 Kilocycles, 211.1 Meters:
EFXY, KGF, KFND, KGCN, WKBT, WSSH, WLEX, WKBP, WMB, KGH, KGF, WLB, WBR, WHP, WSR, KGF, KCGW, KORB, KMEB, KFIF, WEDH, WRAX, KFOW, KRF, KFIZ, WLB, WMB, WOB, KICK, WIA, KXRO, KFO, KGTT, KGCX, WBR, WAAD

1430 Kilocycles, 209.7 Meters:
WICC, WRBL, WMB, WGC, WNB, WCAH

1440 Kilocycles, 208.2 Meters:
WMBD, WTAD, WMAC, WOKO, WHEC, WABO, WNRC, WABF, KLS, KGY

1450 Kilocycles, 206.8 Meters:
WTFI, KSA, WSAR, WNBH, WKBO, WNI, WBMS, WRNY, WFJC, WBS, WJAY

1460 Kilocycles, 205.4 Meters:
KSTP, WTEF

1470 Kilocycles, 204.0 Meters:
WRUF, WHT, KFJF, KGA

1480 Kilocycles, 202.6 Meters:
WORD, WBO, WJAZ

1490 Kilocycles, 201.6 Meters:
WBAW, WLAC

1500 Kilocycles, 199.9 Meters:
WIBZ, KPJM, KGI, KFOW, WAFD, KWTC, KFRC, KFUP, KFJ, WKBV, WMES, WLOE, WKBZ, WRB, WMO, WNB, WCLB, WLBX, WNB, WWR, KWBS, WCA, WSN, WBBW, WOO, PWSW, WALK, WMBA, WMB, KFY, KGKB, KGHX, KGR, KFBL, KUJ, KVL


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CANADIAN STATIONS

Table listing Canadian radio stations by province (Prince Edward Island, Quebec, Saskatchewan, Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario) with columns for Call, Wave, Power, and Call, Wave, Power.

SHORT WAVE PHONE AND TELEGRAPH STATIONS

Table listing short wave phone and telegraph stations with columns for Call, Wave, Power, and Call, Wave, Power.

SHORT WAVE TELEVISION STATIONS

Table listing short wave television stations with columns for Call, K.C., Meters, Owner, Apertures, Call, K.C., Meters, Owner, Apertures.

FOREIGN BROADCAST STATIONS

(Much of the data here shown is supplied by the Bureau of Foreign and Domestic Commerce Division of the Department of Commerce)

Large table listing foreign broadcast stations by country (Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Chile, China, Cuba, Africa North and East, Africa South) with columns for Call, Wave, Power, Call, Wave, Power, Call, Wave, Power.

Call	City	Wave
2JE	Mariaha	245
51W	Matanzas	270
6HS	Sagua la Grande	200
6KP	Sancti Spiritus	195
8HS	Santiago	200
8DY	Santiago	250
SFU	Santiago	225
81R	Santiago	190
83Q	Santiago	130
6XJ	Tuinucu	278
6KW	Tuinucu	340

CZECHOSLOVAKIA

OKR	Bratislava	300
OKB	Brum	441.2
	Kosice	263
OKP	Kosice	1870
	Prague	384.9

DENMARK

D7RL	Copenhagen	84.25
D7MK	Copenhagen	82.05
	Copenhagen	337.4
	Kaunborg	535
	Ryvang	1150
	Soro	1153.8

ESTONIA

	Tallinn	408
	Tallinn	1200

FINLAND

	Bjorneborg	254.2
	Helsingfors	500
	Helsingfors	31.5
	Helsingfors	240
	Jacobstad	275.2
	Jyvaskyla	297
	Lahdis	1515
	Lahdis	31.8
	Mikeli	566
	Tammerfors	400
	Uleaborg	250
	Viborg	240

FRANCE

2BD	Agen	297
	Agen	30.75
	Beziers	180
	Bordeaux	410
	Fecamp	200
	Grenoble	416
	Jnan les Pins	246
	Limoges	285
	Lille	297.3
	Lille	291
VR	Lyons	40.2
VN	Lyons	480
	Marseilles	300
	Monte de Marzan	390
	Montpellier	238
	Nancy	15.5
	Nimes	240
FSAY	Nogent sur Seine	80
	Paris	1750
	Paris	308
FL	Paris	2650
CFR	Paris	7.65
FTTT	Paris	458
	Paris	350
	Paris	340.9
FL	Paris	32
FSGC	Paris	61
	Paris	87
	Rennes	294
	Strasbourg	222.2
MRD	Toulousse	260
	Toulousse	389.6

GERMANY

	Aix-la-Chapelle	400
	Augsburg	566
	Berlin	566
AFT	Berlin	1260
	Berlin	438.9
	Breslau	272.2
	Breuen	272.2
	Cologne	283
	Danzig	272.7
AFK	Dobertiz	67.63
AFK	Dobertiz	87.63
	Dortmund	283
	Dresden	275.2
	Elberfield	268.8
	Ereilburg	577
	Frankfurt	48.6
	Gleiwitz	320.7
	Hanover	297
HA	Hamburg	394.7
	Kaiserlautern	204.1
	Kassel	252.1
	Kiel	254.2
	Konigsberg	303
	Laugenberg	468.8
	Leipzig	365.8
	Munchei	535.7
	Munich	235.7
	Munster	241.9
AGJ	Nauen	56.7
AGU	Nauen	17.2
	Norddeich	1829
	Nuremberg	241.9
	Scharbeck	230
	Stettin	246.2
	Stuttgart	379.7
AFB	Zeesen	4000
APP	Zeesen	2900
	Zeesen	1250

GREAT BRITAIN

2BD	Aberdeen	500
2BE	Belfast	306.1
5YU	Birmingham	329.1
6BM	Bournemouth	491.9
2LS	Bradford	252.1
5WA	Cardiff	353
2NM	Caterham	32.5
6SW	Chelmsford	24
5GB	Davertry	491.8
5XX	Davertry	1604.3
2DE	Dundee	294.1
2EH	Edinburgh	288.5
5SC	Glasgow	405.4
6KH	Hull	294.1
2LS	Leeds Bradford	277.8
6LV	Liverpool	207.8
2LO	London	361.4
2ZY	Manchester	384.6

Call	City	Wave
5NQ	Newcastle	312.5
5PY	Plymouth	275.2
6FL	Sheffield	272.7
6ST	Stoke-on-Trent	294.1
5SX	Swansea	294.1

HAITI

HHK	Port au Prince	361.2
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HOLLAND

PCJJ	Bloemendaal	566
PEEF	Eindhoven	31.4
HDO	De Bilt	1100
	Hilversum	1060
	Huisen	340.9
	Huisen	1950
PCLL	Knoorwij	18.4
	Scheveningen	1950

HUNGARY

MTI	Budapest	555.6
MT2	Budapest	1050

ICELAND

22SH	Akureyri	192
	Reykjavik	333.3

INDIA AND CEYLON

7RY	Bombay	357.1
2AX	Bombay	320
2FY	Bombay	387
7CA	Calcutta	370.4
VPB	Colombo	800
2GR	Madras	400
2HZ	Rangoon	350

IRISH FREE STATE

6CK	Cork	400
2RN	Dublin	319.1

ITALY

1MI	Milan	315.8
1NA	Naples	333.3
1RO	Rome	449
1LAX	Rome	45

JAPAN

JHRB	Hirasio	37.5
JOKF	Hiroshima	353
JODK	Keijo	357
JOGK	Kumamoto	380
JOKK	Nagoya	369
JOKL	Osaka	385
JFAB	Taipeh	39.5
JOAK	Tokyo	375
JOIK	Sapporo	361
JOHK	Sandai	390

JAVA

JFC	Batavia	220
ANH	Malabar	17
	Surabaya	140
ANE	Vandoeing	31.86
ANE	Vandoeing	15.03
	Vandoeing	310

JUGOSLAVIA

	Zagreb	275.2
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CHOSEN

JODK	Seoul	357
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KWANTUNG

JQAK	Dairen	395
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LATVIA

KCX	Riga	528.8
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LITHUANIA

	Katunas	2000
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MEXICO

CZF	Chihuahua	310
CYR	Mazatlan	475
CYU	Merida	548
CYA	Mexico City	500
CYB	Mexico City	275
CYL	Mexico City	400
CYI	Mexico City	425
CYX	Mexico City	325
CZE	Mexico City	350
CYF	Mexico City	375
CYD	Mexico City	400
CYH	Oaxaca	265
CYJ	Puebla	312
CYQ	Tampico	322
CYT	Tampico	350
CYM	Torreon	225
CYC	Vera Cruz	337
CYD	Vera Cruz	350

NEW ZEALAND

1YA	Auckland	420
3AC	Christchurch	400
3YA	Christchurch	306
4YA	Dunedin	468
2FA	Palmerston	280
2YA	Wellington	420
2YK	Wellington	295

NORWAY

	Aalesund	511
	Bergen	31.25
LGN	Bergen	30
	Bergen	370.4
	Fredrikstad	434.3
	Notodden	410
	Oslo	370.4
	Porsgrund	405
	Rjukan	447.8
	Staranger	277.6
	Tromsø	500
	Tromshjem	243.0

PERU

OAX	Lima	360
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PHILIPPINES

KZIB	Manila	260
KZKZ	Manila	270.1
KZRM	Manila	413

POLAND

	Cracow	422
	Kattowitz	422
	Posen	270.3
AXO	Warsaw	1111
	Wilna	435

PORTUGAL

PIAA	Lisbon	305
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Call	City	Wave
EAT18	Almeria	320
EAT19	Barcelona	302
EAT1	Barcelona	344.8
EAT13	Barcelona	277
EAT9	Bilbao	434.8
EAT8	Cadix	400
EAT16	Cartagena	390
EAT5	Las Palmas (Canary Islands)	250
EAT5	Las Palmas (Canary Islands)	370
EAM	Madrid	30.7
EAT7	Madrid	375
EAT2	Madrid	420
EAT25	Malaga	250
EAT19	Oviedo	280.4
EAT27	Salamanca	297
EAT8	San Sebastian	297
EAT17	Seville	434.8

STRAITS SETTLEMENTS

ISE	Singapore	330
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SWEDEN

SASE	Boden	1190
SMYB	Boras	230.8
SMXJ	Gavle	204.1
SABP	Goteborg	416.7
SMZK	Kum	315.8
SMUC	Eskilstuna	250
SMSB	Halmstad	215.8
SMYE	Halsingborg	229
	Hamar	555.8
SMSL	Indreval	272.7
SMZD	Jonkopling	201.3
SMISW	Kalmar	273.8
	Karlsborg	52.2
SMSM	Karlskrona	196
SASG	Karlstad	220.6
SMTG	Kiruna	238.1
SMTJ	Kristinehamn	205.7
SMUW	Linkoping	500
SMXO	Malmberget	400
SASC	Malmo	260.9
SASG	Motala	1380
SMVY	Norrkopling	273.2
SMTI	Orrebro	236.2
SMZA	Ornskoldsvik	187.5
SASF	Ostersund	720
SMTS	Safte	252.1
SASA	Stockholm	454.5
SASD	Sturave	545.0
SAMU	Sturave	236.2
SMXQ	Trollhattan	416.7
SMZP	Udevalla	294.1
SMIN	Umea	229
SMRN	Uppsala	500
SMISO	Varborg	297

SWITZERLAND

HDB	Basle	1000
H90C	Berne	32
HBA	Berne	411
HBI	Geneva	780
HB2	Lausanne	850
H9XD	Zurich	85
H9XD	Zurich	32
HZ3	Zurich	500

TURKEY

	Angora	1806

KC	Meters	STATIONS	DIALS		KC	Meters	STATIONS	DIALS	
			1	2				1	2
1500	199.9				1020	293.9			
1490	201.2				1010	296.9			
1480	202.6				1000	299.8			
1470	204.0				990	302.8			
1460	205.4				980	305.9			
1450	206.8				970	309.1			
1440	208.2				960	312.3			
1430	209.7				950	315.6			
1420	211.1				940	319.0			
1410	212.6				930	322.4			
1400	214.2				920	325.9			
1390	215.7				910	329.5			
1380	217.3				900	333.1			
1370	218.8				890	336.9			
1360	220.4				880	340.7			
1350	222.1				870	344.6			
1340	223.7				860	348.6			
1330	225.4				850	352.7			
1320	227.1				840	356.9			
1310	228.9				830	361.2			
1300	230.6				820	365.6			
1290	232.4				810	370.2			
1280	234.2				800	374.8			
1270	236.1				790	379.5			
1260	238.0				780	384.4			
1250	239.9				770	389.4			
1240	241.8				760	394.5			
1230	243.8				750	399.8			
1220	245.8				740	405.2			
1210	247.8				730	410.7			
1200	249.9				720	416.4			
1190	252.0				710	422.3			
1180	254.1				700	428.3			
1170	256.3				690	434.5			
1160	258.5				680	440.9			
1150	260.7				670	447.5			
1140	263.0				660	454.3			
1130	265.3				650	461.3			
1120	267.7				640	468.5			
1110	270.1				630	475.9			
1100	272.6				620	483.6			
1090	275.1				610	491.5			
1080	277.6				600	499.7			
1070	280.2				590	508.2			
1060	282.8				580	516.9			
1050	285.5				570	526.0			
1040	288.3				560	535.4			
1030	291.1				550	545.1			



on *half* of the Keyboard

AND that is what the majority of people who own Radio sets are trying to do... And the worst of it is that they do not know any better. They have been listening to "Radioed Music" so long that their ears have become accustomed to only about half of the program which was being broadcast.

Now it is possible to transform those sets so that all of the program is heard.

The AmerTran Power Amplifier, a complete 2 stage Push-Pull Amplifier and its companion Unit, the AmerTran Hi-Power Box supplying 500 volts to the plates of the Power Tubes will make your set superior to the finest manufactured sets.



Power Amplifier



Hi-Power Box

AmerTran Push-Pull Amplifier—complete 2 stage audio amplifier. First stage AmerTran Push-Pull for two power Tubes. Choice of standard amplifier or UX 227 AC for 1st stage and two 171 or two 210 power tubes for second stage. Price, east of Rockies—less tubes—\$60.00

AmerTran ABC Hi-Power Box—500 volts DC plate voltage, current up to 110 ma; AC filament current for rectifier, power tubes and sufficient 226 and 227 AC Tubes for any set. Adjustable bias voltages for all tubes. Price, east of Rockies—less tubes—\$95.00

Learn what radio can be—listen to the whole keyboard as it is played in the studio. Write to us now and let us arrange a demonstration for you. No obligation, of course, but prepare yourself for a musical treat.

Before you buy a new set—let us show you what your old set, AC or DC, will do when it is brought up to date with AmerTran Products.



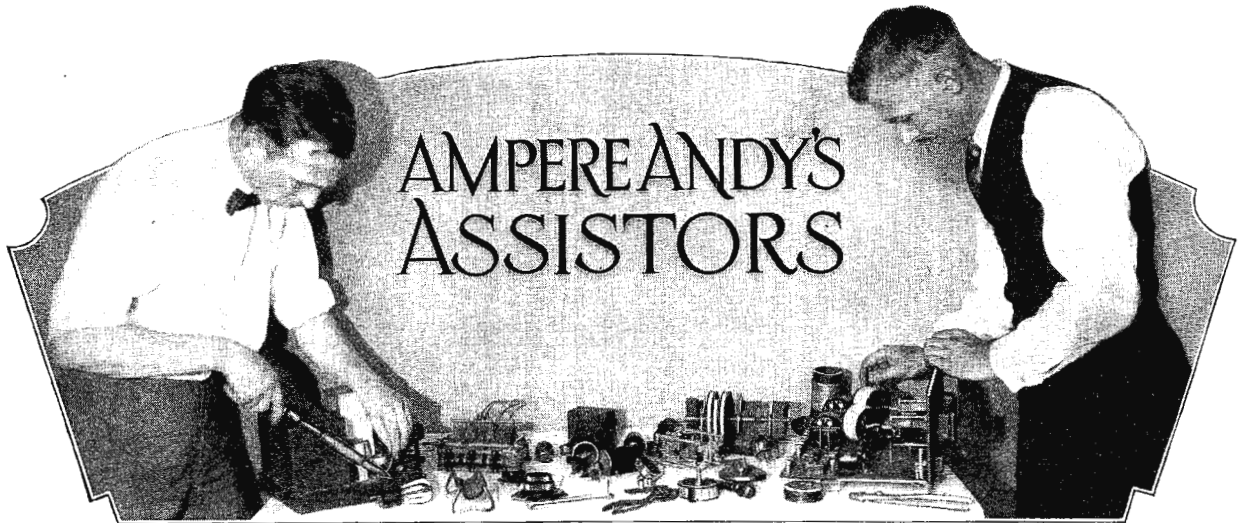
American Transformer Company
Transformer Builders for over 28 years
201 Emmet Street : : : Newark, N. J.

American Transformer Company,
201 Emmet St., Newark, N. J.

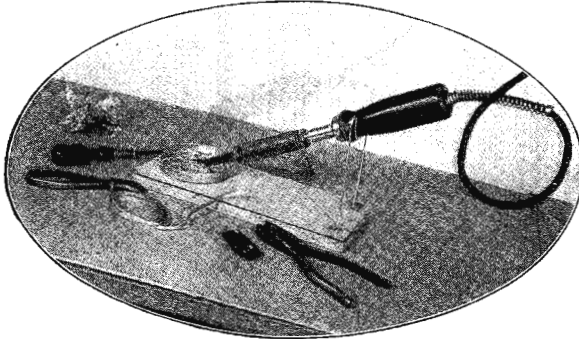
Kindly arrange for a demonstration for me.

Name.....

Address.....

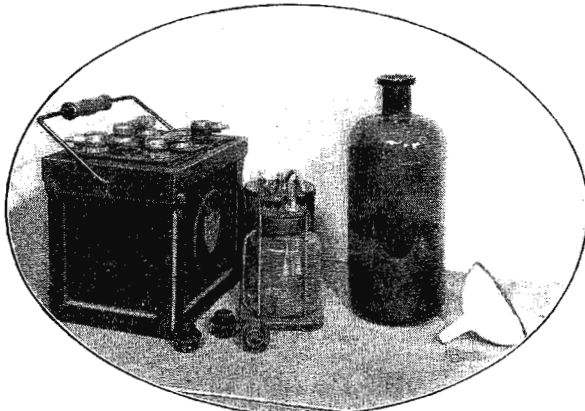


Keeping Soldering Iron Tinned



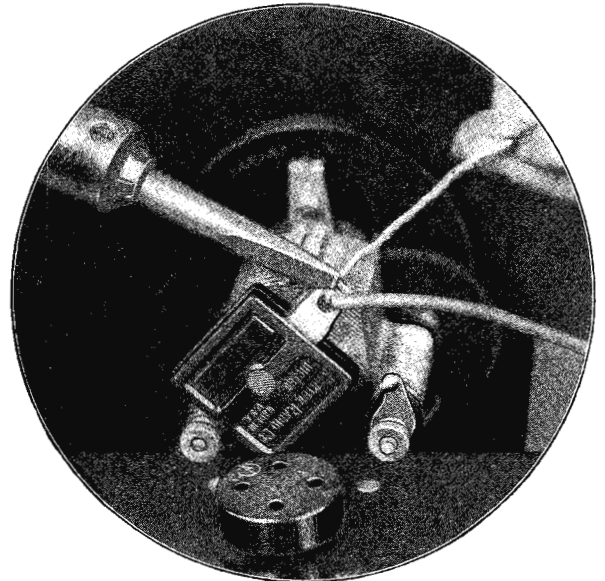
The professional set builder finds that he spends a considerable amount of time keeping the soldering iron well tinned. This can be overcome by keeping the tip of the iron partly submerged in solder in the following manner. Procure a block of wood about 10" long, 4" wide and 1/2" thick, upon which mount a heavy piece of transite board. To one end of the block fasten a can cover such as may be procured from a baking powder can. Then at the other end of the block of wood a stand is mounted which may be constructed from a piece of heavy wire as shown in the illustration. Melt considerable solder in the can cover and place the tip of the iron in it. This keeps the iron from coming in contact with the air, and consequently keeps it free from oxide.

Rain Water for Storage Batteries



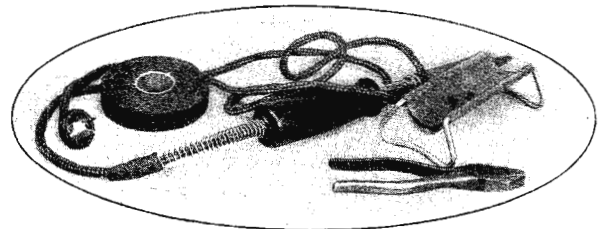
Water from the city supply usually contains a certain amount of mineral salts and should not be used in storage batteries or chargers as it will deteriorate the elements therein, thus shortening their life considerably. Only water free from impurities should be used, first of which is distilled water which may be purchased from almost any drug store. Rain water or melted snow makes a very good substitute for the distilled water and may be gathered at no expense whatsoever. Rain water if kept in a metal container, will absorb some of the metal. This being the case, water to be used for storage batteries or chargers should always be kept and handled in nonmetallic containers.

Preventing Tube Burnouts



A safeguard to prevent accidental burning out of oscillator tubes in a superheterodyne is revealed in the accompanying photograph, where a .006 fixed condenser is being placed in series with the variable condenser, so that if by chance the plates of the variable condenser are shorted, the tube will not suffer accordingly.

Protection for Soldering Iron Cord



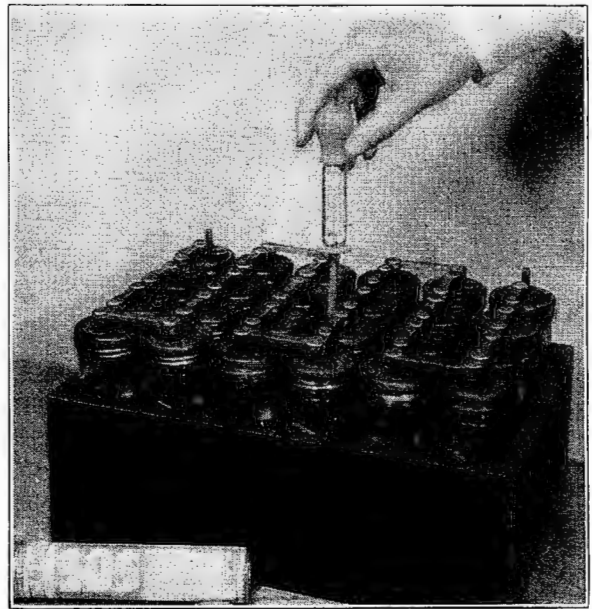
One of the things that grieve the set builder is to find the soldering iron cord broken. This is naturally hard to repair, due to the place in which it most frequently breaks. Constant bending of the cord which causes the break is confined to the section next to the soldering iron handle. Breaking of the cord may be prevented by procuring a piece of light steel spring from a shade roller or one somewhat similar to that. Slip about four inches of this coil spring over the iron cord up to the handle and secure it with tape. This distributes the bending over a much greater area and, therefore, prevents the cord from breaking. Some soldering irons are already equipped with the protector when purchased.

Making a Galvanometer



Wind about 40 turns of No. 28 wire around a small pocket compass as shown in the accompanying illustration. Mount on a block of wood bringing the two ends of the coil out to binding posts. When using this instrument, turn the block of wood so as to make the compass needle parallel with the turns of the coil. Then when a minute current is passed through the winding, the needle will be deflected either to the right or left depending upon the polarity of the flow of current. This makes a very sensitive and valuable instrument for testing the windings of transformers and other pieces of apparatus for short circuits, and opens.

Locating Noisy Cell



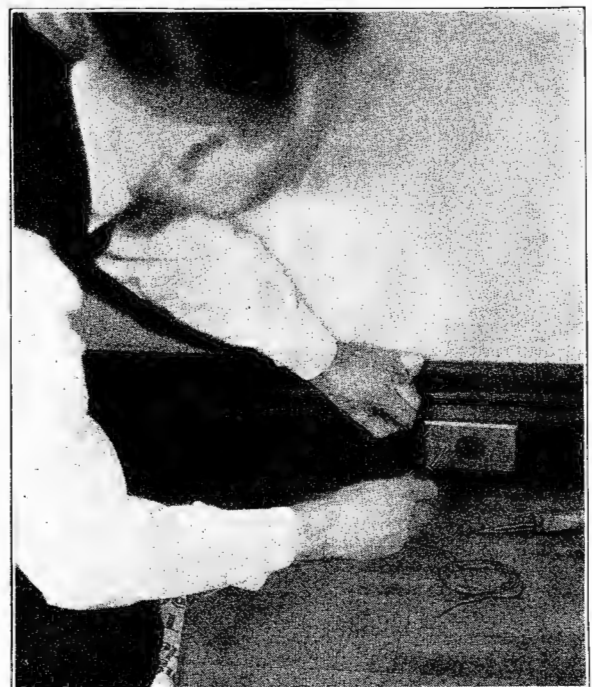
Radio fans who have occasion to use wet B batteries for plate supply may once in a while encounter noise in such supply. Some of this noise might be traceable to a single cell in the bank, which may be discharged below the voltage of its neighbors. A simple means of testing to locate the low cell is shown in the picture, where a small hydrometer with two white and one red balls inside the barrel are illustrated. The colored balls will either sink or swim in accordance with the specific gravity of the electrolyte.

Corroded Connections



In this picture the repair man is looking for sources in trouble in corroded joints. The wire from the top of the intermediate transformer to the base has two soldered connections, while a third soldered connection is located on the sub-panel underneath and is engaged by the screw which holds the intermediate to the sub-panel. Whenever a multiplicity of soldered connections occur, there is always a possibility of corrosion. A better way of making the connection would be to drill a hole through the sub-panel, dropping the wire from the top of the intermediate through the sub-panel to the desired position on the bottom, this method eliminating two of the soldered connections necessary.

Outlet as a Ground Connection



Many times it is necessary to run a wire from the radio set across the room and down the side of the building two stories or more below to the ground, only to find that a rod has to be driven into the ground for the connection. This is usually true where the house or flat is heated by hot air and there being no chance to use a steam or hot water radiator for a conductor. A wall outlet of the electric light system will often serve as an excellent ground where the dwelling's wiring is done in conduit pipe. By loosening the screw on the outlet plate a solder lug may be inserted underneath and the ground wire from the receiver soldered to it. If a cold water pipe is available, it should be used in view of the fact that it is one of the best grounds obtainable.

Lightning Safety Gap



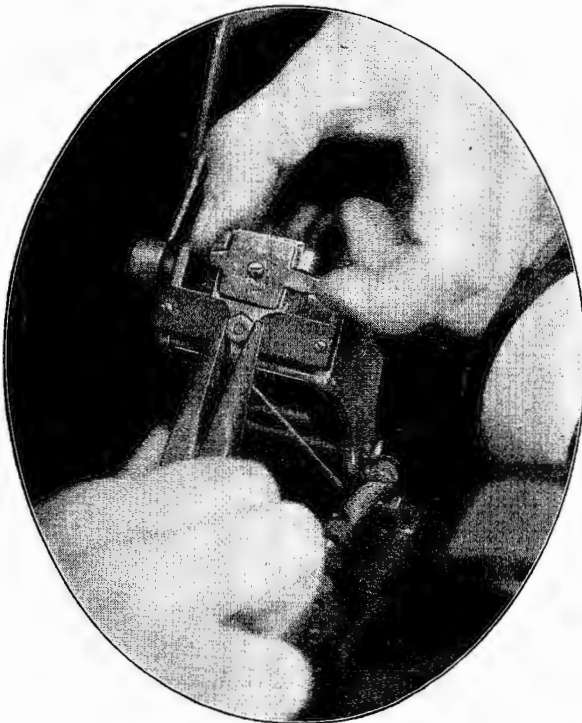
All radio sets should be protected with reliable lightning arresters. Additional protection may be had however, in the following manner: Heat the eye end of two needles over a flame to remove the temper so that they may be bent with ease. They should then be fastened to the antenna and ground binding posts in such a manner that there will be only a very small gap between the points of the two needles. Thus in case a discharge of static passes the lightning arrester, it will jump across these points and pass through to the ground without injury to the set.

Detecting "B" Battery Noises



A great deal of so-called static can be traced to a faulty B battery, even though it may read 45 volts and to all outward appearance is apparently in good condition. When a B battery is run down internal noises are the natural expectation, although some of the batteries die very quietly. To test for a noisy B battery, proceed as follows: Disconnect the batteries from the set, testing one at a time. Connect one cord tip of a pair of head phones to one terminal of the battery holding the other tip tightly in the hand and with the forefinger and thumb of the same hand grasp the other battery terminal. If a steady crackling sound is audible, you may rest assured that the disturbance resides within the battery. Do not connect both receiver tips directly across the battery as it will invariably ruin the phones.

Raising Condenser Wavelength



Occasionally an operator will find that his tuning condenser does not quite reach the highest wave station on the broadcast band. The device shown in the accompanying photograph is a small midjet semi-variable condenser, generally called a trimmer, which is being placed in parallel to the main tuning capacity so that the maximum capacity of the condenser is increased. Of course, at the same time the minimum of the condenser is increased but not to any great extent.

Safeguarding Your Meter

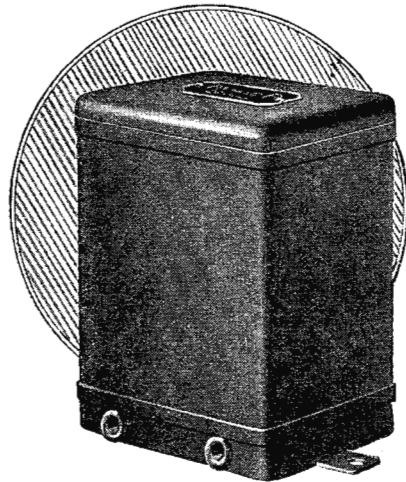


When testing a B eliminator for maximum output with a low reading milliammeter, a fixed resistance of 1000 ohms or more should be placed in series with the meter to protect it from a burn-out.

Compensating AUDIO TRANSFORMER

*will improve
any radio set!*

YOUR own experience tells you that the old audio systems fail to give proper amplification of the lower notes. Especially when you use a dynamic speaker, you realize that electrical energy is not delivered over the complete range of the speaker. What's the answer? Just this—that once more Remler has solved a radio problem. Now Remler provides a new compensating transformer that will reproduce all these notes you have lost in the past.



No. 905 ~ ~ Price \$8.00

Dimensions:
2 1/8" wide, 2 1/2" long, 3 1/4" high

UNIQUE in design, built on the usual rigid Remler specifications, and finished with the customary Remler care, this transformer sells itself to everyone who has heard it. It emphasizes amplification of the lower register to compensate for the falling off of amplification under ordinary conditions.

All you do is to replace the present first-stage with a Remler No. 905 and the job is done. The winding is resonated at a point to compensate for the falling characteristic of the average audio system..

Especially for Dynamic Speakers

Designed especially for use with dynamic speakers, it delivers to them electrical energy over a wide range. Without it, you can never get the effect of dynamic speaker performance. Used with a magnetic speaker, it brings out bass notes that you never heard before. If you are troubled with a 60-cycle hum, just put the problem up to No. 905 and hear the difference.

Remember that this transformer is no experiment. It has proved its value in every popular set and circuit now in use. Behind it is ten years of Remler Radio Reliability.

If your jobber or dealer cannot supply you, write us and we will tell you where they can be purchased.

REMLER

Division of
**GRAY & DANIELSON
Manufacturing Company**

Chicago

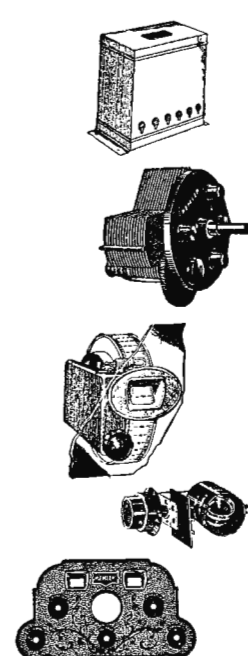
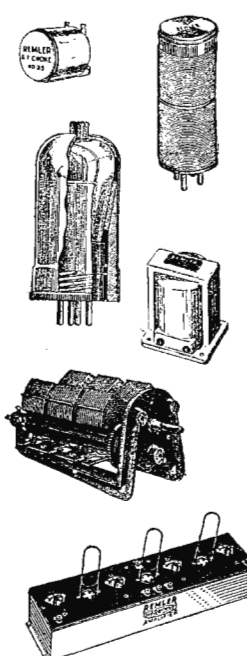
260 1st St., San Francisco

New York



SPECIAL DEMONSTRATING BASE

Dealers and set-builders are using a special pressed-steel demonstrating base to prove the value of the Compensating Transformer. With it, they can plug in this transformer in two minutes and show the startling difference. Switch is provided for cutting in either transformer. Write us direct for full particulars on this base, sold at cost.



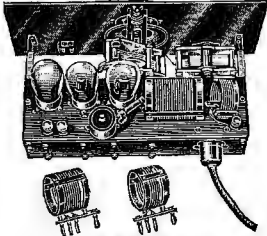
AERO KITS

Another Aero Achievement



INTERNATIONAL Short Wave Receiver

This is the first short wave receiver designed exclusively for the reception of broadcast on low waves. Broadcast reception on short waves is remarkably clear and free from static. Programs come in from greater distances with the utmost simplicity of control. Complete kit includes everything necessary to assemble the set.
Aero Kit No. 8—Price.....\$55.30



STANDARD Short Wave Receiver

This three-tube short wave receiver utilizes a circuit which has been proven by years of excellent results in the hands of amateur operators. The audio transformers are of the same type as are used in broadcasting stations, assuring excellent tone quality even when receiving programs from a great distance.
Aero Kit No. 10 for A. C. Tubes. Price\$49.95
Aero Kit No. 11 for D. C. Tubes. Price\$49.95



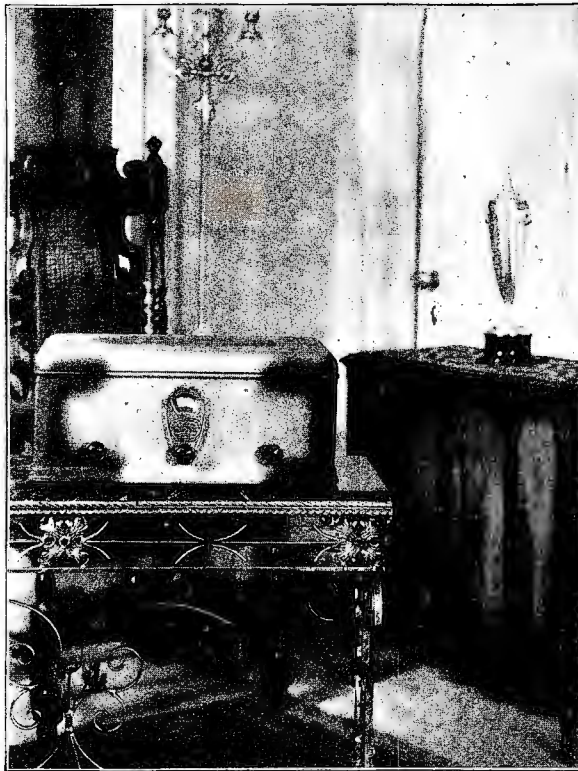
STANDARD Short Wave Converter

You can receive short wave programs on your present set by utilizing this short wave converter. Kit is complete. The base panel has all parts entirely assembled on it, wired and tested. It is only necessary to connect four or five wires to use this converter.
Aero Kit No. 12 for D. C. Tubes. Price\$32.00
Aero Kit No. 14 for A. C. Tubes. Price\$32.00



Short Wave Transmitters

For either the man who wishes to build his first low-power transmitter or for the dived-in-the-wool amateur who wants to purchase all the parts for a high-powered installation from one source, Aero Transmitters are available in complete, easy-to-assemble kits. Prices on application.



CHRONOPHASE

The Aero "Chronophase" principle in Radio Frequency Amplification is the first outstanding development in broadcast reception since the introduction of the neutrodyne. Now selectivity takes on new meaning, for sets employing this principle can be made so selective that even the side bands of local broadcasting stations can be cut off. Greater distance range, too, is achieved with remarkable smoothness of control.

In Three Wonderful Receivers

The 1929 six-tube "Aerodyne," the Aero Seven-Twenty-Nine and the five-tube Aero "CHRONOPHASE" all incorporate the "CHRONOPHASE" circuit. Complete kits for these receivers may be had from your dealer. Every part needed for the construction of the receiver is included so that nothing more need be purchased. Panels are drilled, which insures proper placement of parts and full-size pictorial wiring diagrams eliminate mistakes in wiring. Aero sets can be built for A. C., D. C., or Shield Grid tubes.

A postcard request brings two valuable booklets—introducing the new 1929 line of Aero Kits and describing the 64 page Aero Green Book for 1929. Send to

AERO PRODUCTS
INCORPORATED

Dept. 1088 4611 E. Ravenswood Ave. Chicago, Ill.



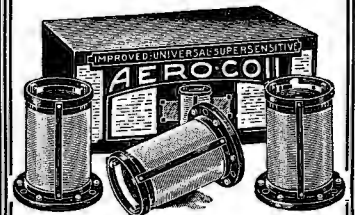
Audio Transformers

Now, for the first time, there is made available to the public the same type of audio transformers as are used in broadcasting station line amplifiers. The use of these transformers in a receiver results in an amazing fidelity of tone with all overtones equally amplified. A depth and richness is achieved which cannot be obtained with ordinary transformers.
Price\$8.00



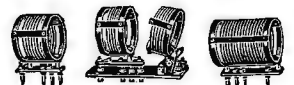
Filament Transformer

Aero Filament Transformers are specially designed so that they will furnish power for 6 UY 227 tubes without any variation. This transformer will also supply power for 2 UX171-A tubes. This is equipped with a 6 foot cord and plug for ready attachment.
Price\$8.00



Universal Broadcast Receiving Coils

Aero Universal Coils, for broadcast reception, will make any circuit better in selectivity, tone and range. They are of true low-loss construction. All coils are twice matched at both ends of the broadcast band and thus absolute uniformity is assured. May be purchased singly or in kits for use in every type of circuit.



Short Wave Receiving Coils

Ever since they were first introduced Aero Interchangeable Coils have been acknowledged the finest short wave coils obtainable, due to their extreme low loss construction, general sturdiness and excellent electrical characteristics. These coils are of the plug-in type and are furnished as complete tuning kits. Wave lengths from 16.5 to 89.5 meters are covered by these kits and extra coils may be purchased, increasing the range to cover all wave lengths from 13 to 550 meters.

THE ROBERTSON-DAVIS AUTOMATIC SUPER-SIX RECEIVER

has Everything You Want in Radio

AUTOMATIC TUNING

- A. C. OPERATION ENTIRELY
- IMPROVED TONE QUALITY
- ONE SPOT RECEPTION
- ONLY 3 CONTROLS



READ THE MANY OTHER FEATURES BELOW



ROBERTSON-DAVIS AUTOMATIC SUPER-SIX

ALL ELECTRIC

- SIX TUBE SUPERHETERODYNE
- 3 STAGES A. C. SHIELD GRID
- 10 KILOCYCLE SELECTIVITY
- SINGLE DRUM DIAL



ASSEMBLED COMPLETE IN A FEW MINUTES

The only Custom-Built Set that is Automatically Tuned

No other custom-built receiver has the automatic feature. The R-D Automatic Super-Six can be supplied with or without the Automatic Electric Tuner. It automatically converts the set from a dial-controlled into a push button-controlled receiver. Just press button—your favorite station plays.

Any six stations can be selected for automatic playing, and these can be changed at will. One button controls each of your six favorite stations, and another button is provided for set operation from the single illuminated drum-dial. Depressing any one of the seven buttons automatically cuts out all the rest, and brings in only the station desired from the six selected on the Automatic Electric Tuner, or any other you wish to tune in with the drum-dial on the receiver.

Tuning is greatly simplified, no potentiometer being used. Only tuning controls are the single illuminated drum-dial or the Automatic Electric Tuner button, the trimmer condenser used when searching for extreme distance, and the volume control. No aerial required. Antenna and ground may be used, if desired; but only a few inches of wire are necessary for the pick-up.



Every Robertson-Davis Automatic Super-Six Receiver and Automatic Electric Tuner is completely wired and tested on the air in our laboratory before it is shipped to you. A.C. reception is the most marvelous and economical in radio; but the intricate wiring must be done with precision by an expert. After the Super-Six is wired and tested, anyone can fit it together. Our engineers are of the best, oldest and most experienced in radio. You are assured of entire satisfaction. That is why the majority of fans are buying or building this receiver this year.

You get the receiver ready to assemble in a few minutes—it fits together like a set of toy building blocks. All instruments are fitted and housed in the sub-panel except the trimmer, condensers and volume control, which are mounted directly on the panel. A beautiful panel is supplied free with each receiver, drilled ready to use. Panel 7x21 in. Chassis 12 in. deep.

Everything is completely shielded. Set is entirely A. C. operated, using 3 Arcatrus A. C. Shield Grid Tubes and 3 Arcatrus-28 A. C. Tubes—obtainable everywhere. Set is quickly adapted for Television or Short Wave use by changing antenna and oscillator coils.

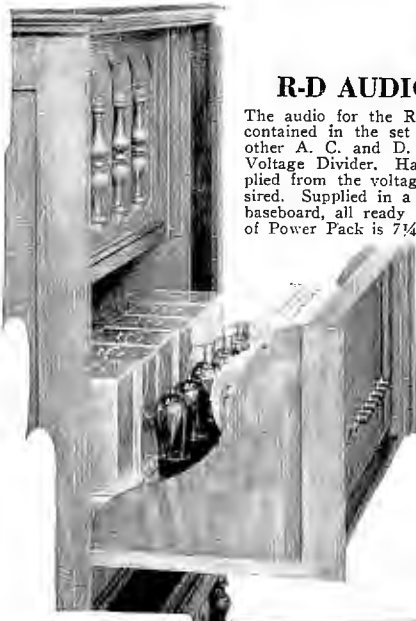
R-D AUDIO AND A-B-C ALL ELECTRIC POWER PACK

The audio for the R-D Automatic Super-Six Receiver is all carried in a separate unit—none contained in the set proper. This eliminates trouble from magnetic fields experienced with other A. C. and D. C. receivers. This unit is a special 210 Push-Pull Type with R-D Voltage Divider. Handles a Dynamic Power Speaker. Field voltage of 100 volts supplied from the voltage divider. Equipped to be used with Phonograph Pick-up, if desired. Supplied in a complete set of factory-packed parts, hardware, accessories and baseboard, all ready to assemble. Baseboard, 12x18 in. Over-all assembled height of Power Pack is 7 1/4 in.

This is your opportunity to have the best in radio for the same price as an ordinary receiver. Mail the coupon or write for particulars.

ROBERTSON-DAVIS COMPANY, Inc.

361 W. SUPERIOR ST.
DEPT. CB-12
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U. S. A.



SET BUILDERS: MAKE REAL MONEY WITH THIS QUICKLY ASSEMBLED, FOOL-PROOF RECEIVER. WRITE FOR BUILDER'S DEAL.
RADIO FANS: GET DX OR LOCAL WITH INCOMPARABLE TONE AND VOLUME. SEND COUPON FOR FREE LITERATURE.

28
CB-12

ROBERTSON-DAVIS CO., INC.
 361 W. SUPERIOR ST.
 CHICAGO, U. S. A.

Gentlemen: Please send without charge or obligation, complete literature on the Robertson-Davis Automatic Super-Six Receiver, Automatic Electric Tuner and the R-D Audio & A-B-C All Electric Power Pack to operate them.

ARE YOU A SET-BUILDER? YES NO

Name.....

Address.....

Victoreen 1929 A. C. Is All-Electric Superheterodyne Receiver

Special Oscillator, Redesigned R. F., Sharpened Loop Circuit
Features of New Set

BELIEVING that 1929 heralds the first all electric year in radio, Victoreen, who have been well known as designers of a super for many years have this season redesigned their products in order to make an all-electric superheterodyne receiver. A radio placed in the home today amounts to almost a utility and for this reason the designer believes it desirable to eliminate such nuisances as battery worries and unnecessary tinkering. The Victoreen 1929 A. C. receiver has been designed after careful research into alternating current requirements for superheterodyne work. The set renders a most natural reproduction with a clear cut differential between the spoken word and music note. Compact in assembly and free from frills, this hookup has a most pleasing appearance and simplified panel layout and incorporates every feature for quality reception and reduces the number of panel controls to a minimum consistent with practical operation. This assembly is simplicity itself and results meet the requirements of the most exacting radio critics.

Among the improvements noted in the redesigned circuit for the new season are the following:

1. An improved method of detection.
2. A simplified volume control.
3. A special oscillator eliminating objectionable repeat points.
4. A simplified circuit making assembly still easier.
5. A special fixed adjustment in the oscillator to simplify tuning.
6. A redesigned and improved type of r. f. transformer.
7. A sharpened loop circuit without regeneration, and variable adjustments reduced in number.

Redesigned Coils

The r. f. transformers used in the new Victoreen are designed

on the same principle as the old type which proved their worth over a period of years. Each unit contains a variable condenser and is tuned and sealed at the factory to a standard frequency of 90 kilocycles. An adjustment is made at the factory by means of which the gain per stage is closely controlled. It is not necessary to place these transformers at an angle due to the controlled gain per stage.

The new oscillator coil contains adjustment made at the factory where each oscillator is tuned to cover a definite frequency range. This special feature makes the oscillator and antenna circuits tune together through the broadcast range. In order to overcome harmonics it is essential that the resistor shown in the schematic circuit Fig. 5 with a value of 25,000 ohms in series with the plate of the oscillator tube be employed. This oscillator requires an extremely low plate voltage and partly to this fact may be attributed the absence of harmonics.

Single Tuning Control

Tuning of the receiver is by means of a single control dial which includes a rack and pinion governing the two Renler .0005 condensers. Although the set may be tuned by the two single Renler condensers nevertheless it is recommended for increased selectivity that the condensers be used in the single control unit. On account of the design of this particular receiver, it is not necessary that compensating means be provided.

An inspection of the schematic circuit in Fig. 5 will show that rectification in both the first and second detectors is by means of C bias. This method of plate rectification gives unusual quality and considerable stability in detector circuits.

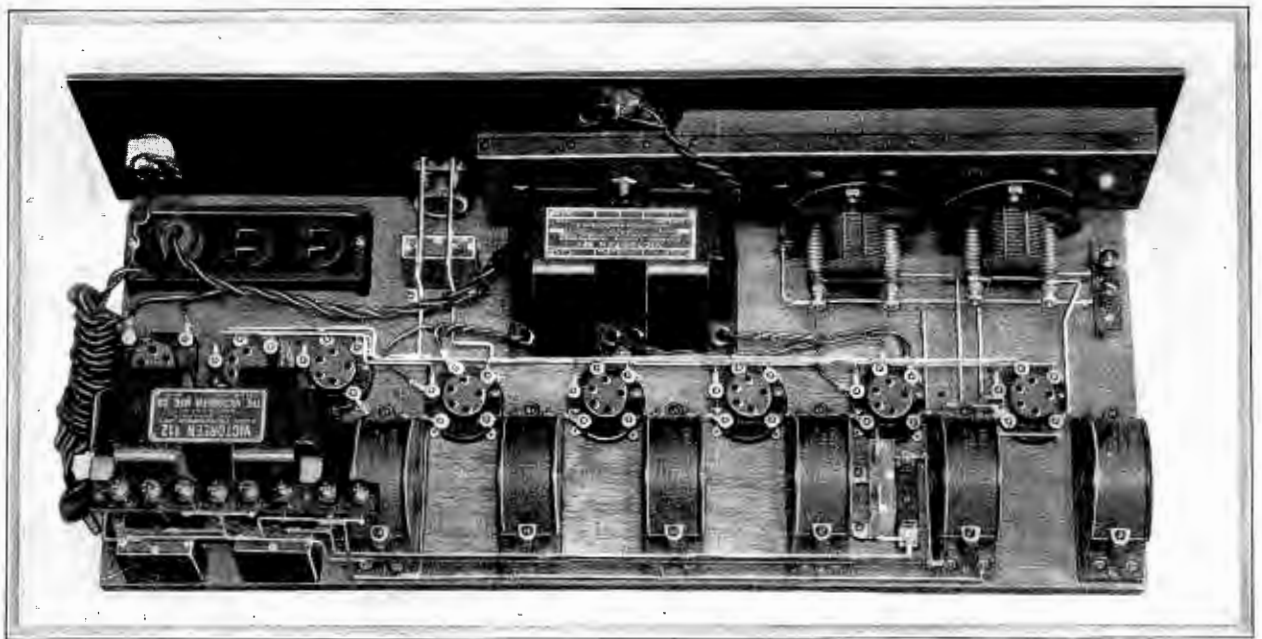


Fig. 1. In the photograph above is shown the rear top view of the new Victoreen Super described in the accompanying article. Baseboard form of layout is used for simplicity and sturdiness

(This receiver tested and all illustrations made in our laboratory)

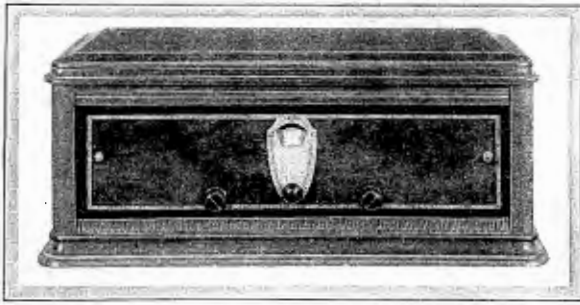


Fig. 2. The completed receiver has here been placed in an attractive cabinet

The intermediate stages of this model are designed for operation for 90 volts plate potential. The use of this voltage on the first six tubes permits the same grid voltage to be applied to the detector as is applied to the first audio stage thus simplifying the circuit. In addition to that, it permits the use of a 90 volt regulator tube which assures a constant potential and eliminates reaction from the audio circuits. As usual the audio stages are combined into a single unit which method has been found quite satisfactory by Victoreen. The unit reproduces all of the naturalness of the original program and is well known for its wide frequency range and freedom from distortion. It is designed to handle plate potential up to 500 volts.

The filament transformer used is designed to supply standard a. c. tubes slightly below their rated voltage. This transformer is standard only for 50 to 60 cycle used and is normally furnished from a voltage from 108 to 112 volts of the supply line. Within this transformer are contained two separate 2½ volt windings and one 5 volt winding, all of which are center tapped. The 2½ volt winding supplies up to five 227 tubes, while the 5 volt secondary will handle two 112 A's or one 210. A pair of leads is brought out from the 5 volt secondary for lighting the dial lamp. In order to safeguard the life of the 227 tubes the voltage supplied by the transformer is arbitrarily low.

The 227 tubes have been selected because of their greater stability in operation, eliminating variation in volume with line voltage and at the same time reducing hum to a negligible value. It will be seen by referring to this schematic that the cathode potential is at zero instead of 45 volts which tends to give longer tube life.

Volume Control Method

Volume control employed in the Victoreen certainly is a resistor in common plate return of the intermediates. This variable resistor not only acts to decrease the plate potential but also places a high negative bias on the grids of the intermediate tubes resulting in an extremely simplified volume control. No dial readjustment is necessary when the volume is changed.

In order to secure the best results from the receiver it should be used in conjunction with the power supply designed for it by Victoreen which provides 90 and 180 volt circuits with voltage regulator tubes thus eliminating all questionable voltage controls. This feature, together with the extreme simplicity of wiring and lack of shielding makes an easy to operate set and one that is unaffected by reasonable changes in line voltage. Although the current required for the operation of the first six tubes is less than 10 milliamperes.

B eliminator or power supplies which do not contain at least

two 874 regulator tubes cannot be used. Batteries of course may be used, if desired, although it would probably be more economical to use the power supply.

There are but two C voltages required, 90 volts for two 250 tubes and 8 to 12 volts for receiver proper. Arrangements have been made in the receiver for the inclusion of a phonograph pick-up when desired. The phonograph pick-up cannot be plugged into the detector socket but must be placed in series with the grid return of the second detector. This method is shown in schematic circuit Fig. 5 where a note is given as to the method of inserting the phonograph pick-up.

After a receiver has been wired and thoroughly checked it may be put in operation. The small compensating condenser across the Remler condenser tuning the loop circuit has been provided in order to compensate for the differences between the various types of loops. When tuning in for distant stations the volume control is first increased until the usual rushing sound is heard indicating that the receiver is increasing in sensibility. Next compensator is adjusted to its maximum volume point. The tuning dial is then very slowly revolved until a station is heard. The compensator is then tested and the volume increased by the volume control.

Either loop or aerial may be used on this set. To use the antenna it is merely necessary to remove the loop leads and connect the antenna coupler secondary to the loop posts as shown in the diagram. Regeneration is not recommended with this circuit. A .0005 mfd fixed condenser across the plate of the first detector and cathode will in most cases improve the stability of this circuit.

The C bias must be carefully adjusted. Try values of 9, 10½ or 12 volts to determine which gives the best quality of reception.

Some of the features involved in the power supply designed for use with the Victoreen 1929 a. c. super are: Constant potential is supplied to the 90 and 180 volt terminals, thus making

possible the use of definitely known values of C voltages; fluctuation in the output circuit cannot affect the first audio and cause distortion; no resistor is used for the purpose of C bias, as a separate C supply is deemed far superior; the use of two voltage regulator tubes tends to prevent the possibility of puncturing high voltage condensers; and four voltages are obtainable, 0-90 variable, 90 volts constant potential, 180 volts constant potential and 450 volts.

Service Hints

The flashlight lamp as shown in the schematic in Figure 3 has been included for the protection of the power transformer in the

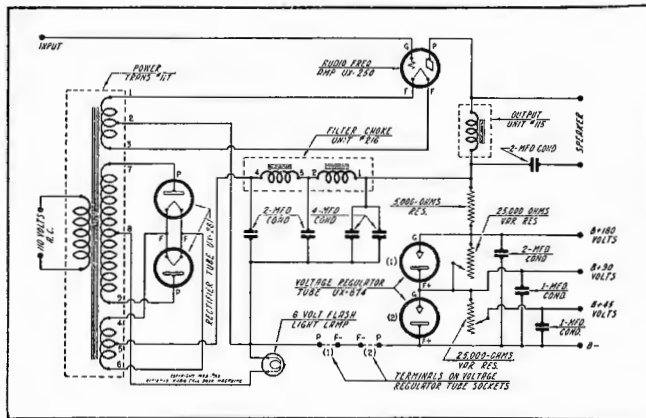


Fig. 3. The schematic diagram of the power amplifier circuit is shown above

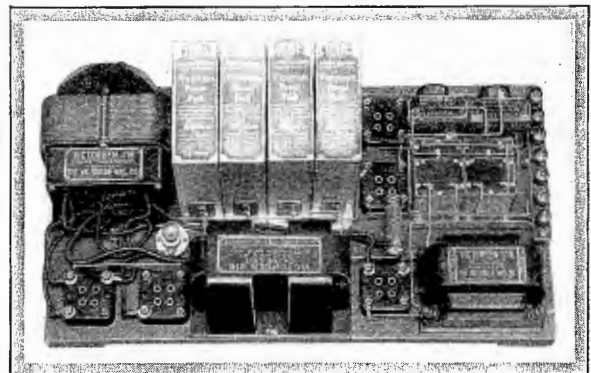


Fig. 4. This photograph represents the completed Victoreen power supply, which is also described in this article

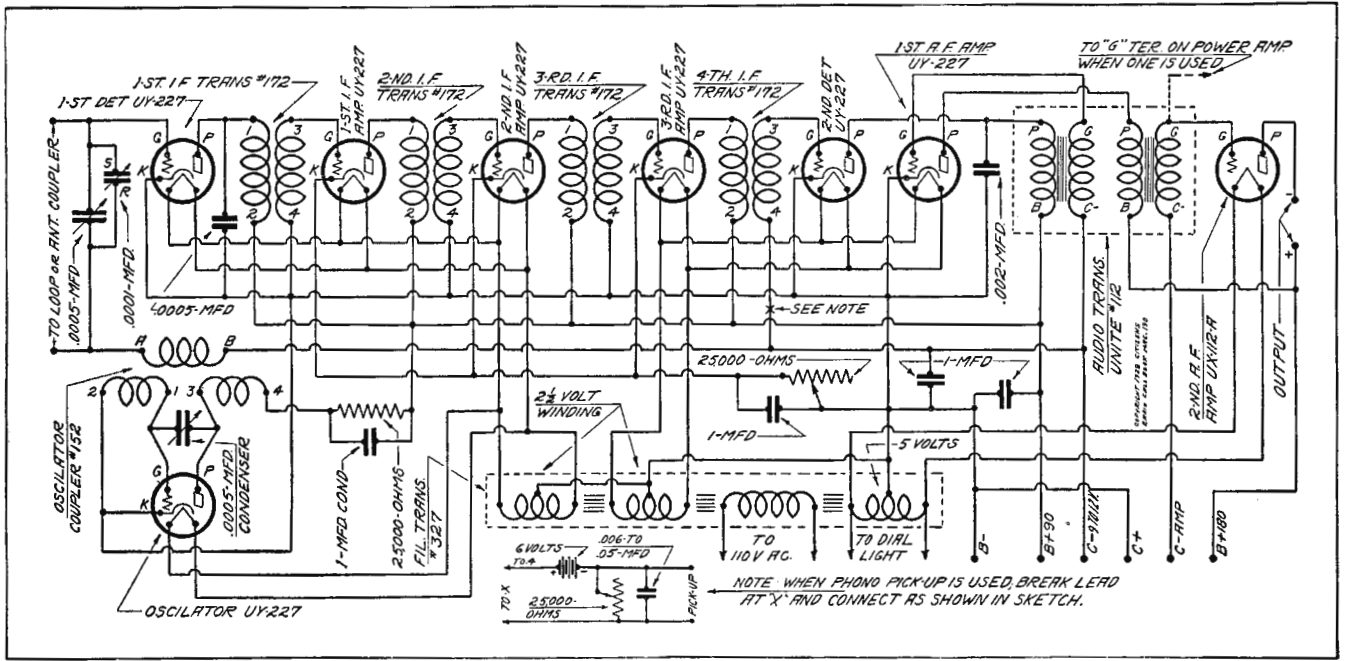


Fig. 5. Above may be seen the schematic circuit of the redesigned receiver for the 1929 season

event of a break-down in the condensers and has a twofold purpose. It is difficult for the novice to distinguish between a broken condenser and a defective power transformer. This lamp, however, will indicate the approximate location of trouble, should any occur. If the first 2 mfd condenser should puncture, the lamp will flash up brilliantly and in the course of several minutes will act as a fuse and open the circuit. If the second 2 mfd condenser should puncture, the lamp will light brightly but will not always burn out. If the first or second 4 mfd condenser is punctured, the lamp will not light quite so brightly, although it will be brighter than in normal operation. The small type condensers have no effect upon the lamp. With the power supply operating under normal conditions and using a 250 tube, the flashlight lamp should be slightly more than glowing. If this lamp should flicker when a loud signal is being amplified, it indicates one of two things, either the C voltage is incorrect, or the input is too great for the 250 tube to handle within its intended limits.

Should the 2 mfd condenser between the positive 180 and B negative become shorted, both voltage regulator tubes will cease to glow. Should the 1 mfd condenser from B-90 to the negative B

become shorted, the 90 volt regulator tube will cease to glow. It is quite unlikely that the 1 mfd from the 45 to the negative will ever be short circuited. Should the 2 mfd condenser in series with the speaker windings become shorted, it is possible that it may cause certain types of speakers to rattle due to a small amount of current going through their windings. This may be checked by a d. c. milliammeter or a d. c. voltmeter in series with one speaker lead while the set is in operation. There should be no indication of current flowing.

When the power supply is used on such radio sets as require larger values of current from the low voltage circuit, it may be necessary to use a lower resistance than the 5000 ohm value shown between the maximum voltage terminal of the filter choke and the 180 volt terminal of the power supply. A lower value would be necessitated if both voltage regulator tubes have a tendency to cease glowing as the load is increased. Lower resistance may be obtained by moving the clip or band of this Truvolt resistor farther down on the resistance element.

It is not necessary to ground the power supply when used with the Victoreen receiver, although a ground may be used if desired,

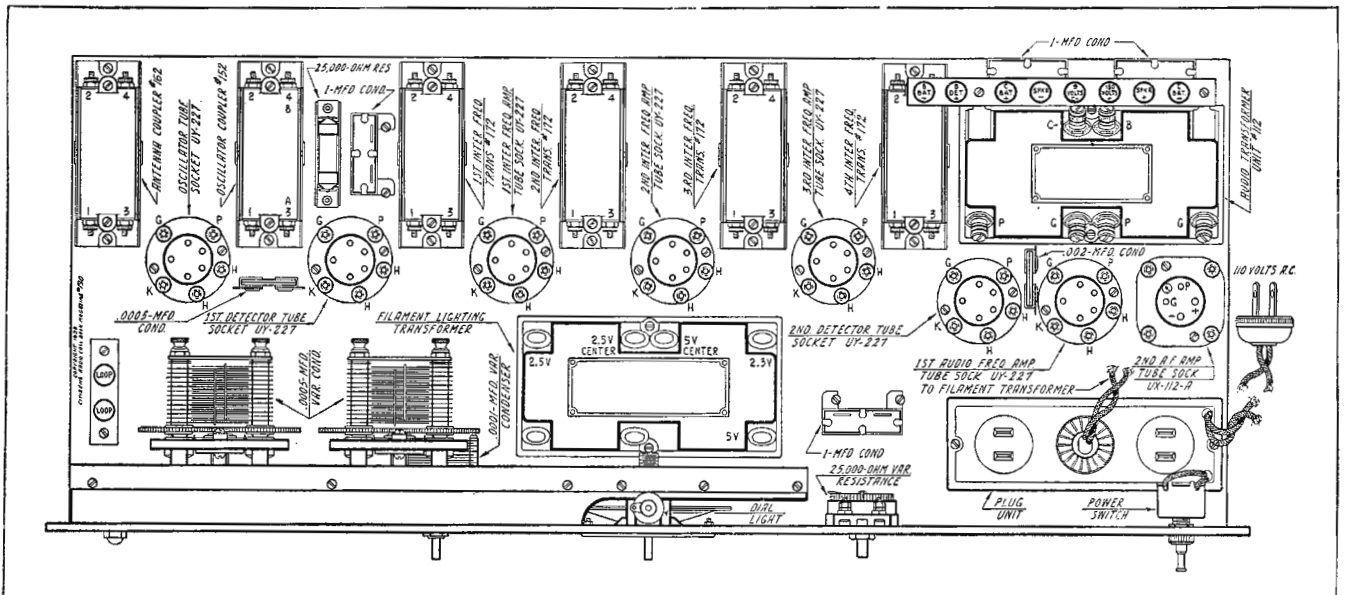


Fig. 6. Layout of all parts should be made in accordance with the baseboard diagram printed above

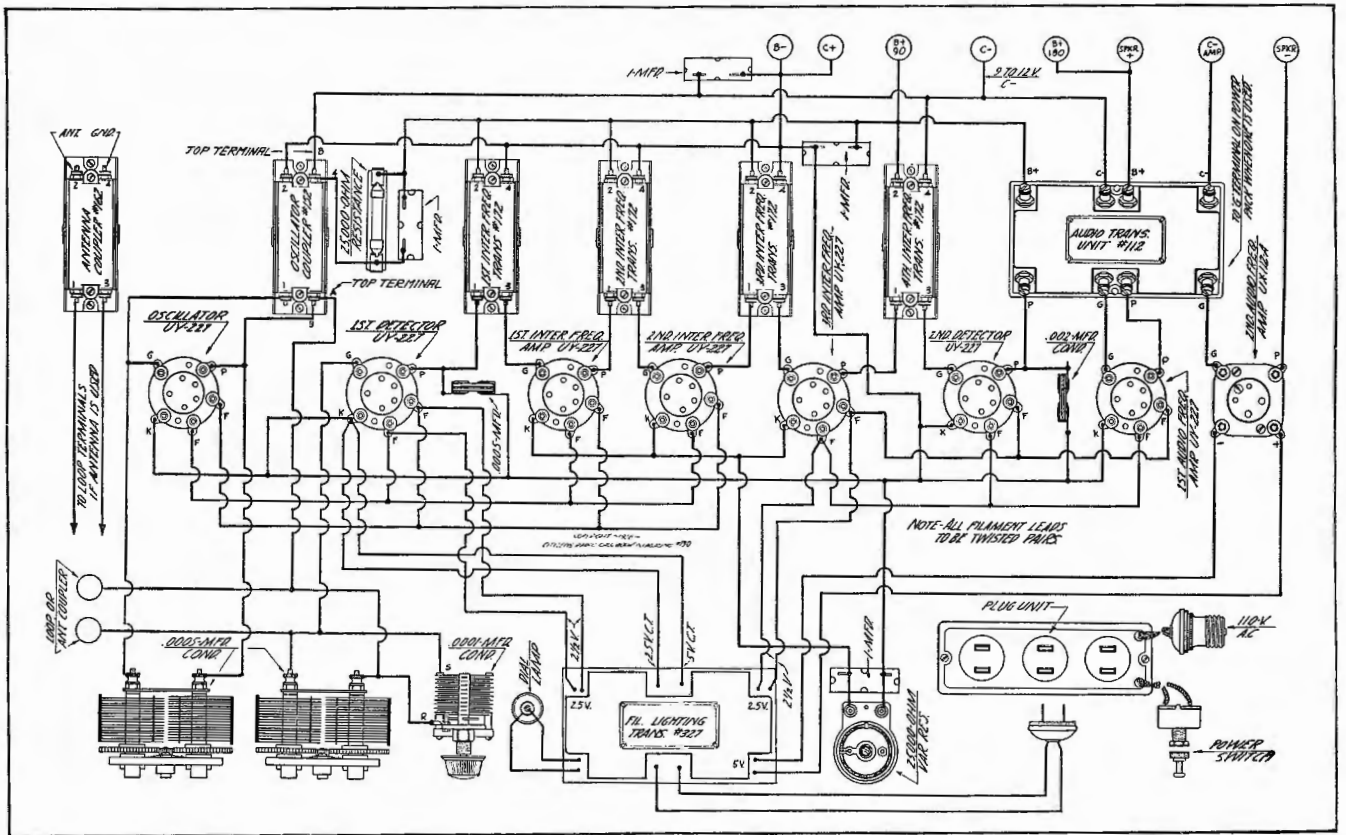


Fig. 7. The novice may use this graphic drawing for hooking up a receiver of the type described in the accompanying article

and if so, it should be connected to the negative B terminals of the power supply. The 250 power tube is much to be recommended in preference to the 210, since it gives a greater undistorted wattage output.

It should be noted that the condenser for use in this circuit should be rated at least 600 volts d. c. operation, with the exception of the four small bypass condensers, which need not have that high a rating.

Official Parts List

Parts required for the construction of the receiver and the power supply are shown in two lists printed below.

Receiver

- 1 Lignole 7x26x $\frac{1}{8}$ inch front panel.
- 1 Formica binding post strip $\frac{5}{8}$ x6 $\frac{1}{2}$ x $\frac{1}{8}$ inch
- 1 Formica binding post strip $\frac{5}{8}$ x2 $\frac{1}{4}$ x $\frac{1}{8}$ inch
- 1 Wood baseboard 10x25x $\frac{1}{2}$ inch
- 4 Victoreen 172 r. f. transformers
- 1 152 Victoreen oscillator
- 1 162 Victoreen antenna coupler

- 1 112 Victoreen audio transformer unit
- 1 327 Victoreen filament transformer unit
- 1 333 Victoreen switch and plug unit
- 1 1929 Victoreen single dial control
- 1 Electrad Royalty 25,000 ohm variable
- 1 Lavite 25,000 ohm fixed resistor—3 watt
- 7 UY Benjamin tube sockets
- 1 UX Benjamin tube socket
- 4 Tobe small 1 mfd bypass condensers
- 1 .002 mfd fixed condenser
- 1 Precise 100 mmf. Microdenser
- 10 Eby binding posts
- 1 Pkg. Kester radio solder
- 36 ft. No. 14 Acme Celatsite hook-up wire
- 7 Ceco or Sonatron 227 tubes
- 1 Ceco or Sonatron 112-A tube

Power Supply

- 1 117 Victoreen power transformer
- 1 216 Victoreen choke unit
- 1 115 Victoreen output unit
- 2 Tobe 2 mfd 600 volt condensers
- 2 Tobe 4 mfd 600 volt condensers
- 2 Tobe small 2 mfd condensers
- 2 Tobe small 1 mfd condensers
- 2 Electrad Truvolt 25,000 variable resistors
- 1 Electrad 5000 fixed resistor
- 5 Frost UX sockets
- 1 Porcelain miniature socket
- 7 Eby binding posts
- 1 Binding post strip
- 1 Baseboard 9 $\frac{1}{2}$ x18 inch
- 1 Ceco or Sonatron 250 power tube
- 2 Ceco or Sonatron 281 rectifier tubes
- 2 874 voltage regulator tubes
- 1 Mazda No. 31 or 6 volt flashlight lamp
- 1 Pkg. Kester radio solder
- 1 Pkg. Corwico Braidite hook-up wire.

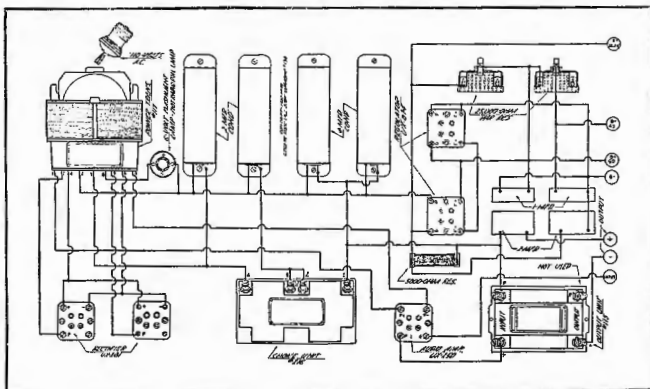


Fig. 8. Those unaccustomed to working from a schematic may use the above graphic for wiring up the power amplifier

Halldorson A. C. 56 Kit May Be Easily Assembled by the Novice

Receiver Uses Two Stages of Radio Frequency Amplification;
Has Own Power Supply

DURING past radio seasons many of the kit manufacturers have been handicapped in their competition against the low priced factory receivers, because the kit makers as a rule manufactured only two or three items required in the construction of the receiver and the balance of the parts were recruited from standard units made by several manufacturers and generally picked up and assembled by the builder. As a result, with the mass production at its disposal, the factory built receiver threatened to absorb a good deal of the market legitimately belonging to the parts makers.

Everything Together

However, beginning with this season, kit manufacturers have come to the conclusion that the logical thing to do is to supply all component parts packed in with the kit, so that there is no possibility of substitution, delay on the part of jobbers in filling orders or loss of time on the part of the builder having to lay out the receiver himself.

The inclusion of all necessary parts in a manufacturer's kit has resulted so far in two benefits, one to the manufacturer and one to the set builder. In the case of the manufacturer a standardized sub-panel layout may be agreed upon and processed panels of metal or insulated material may be supplied at a lower cost than if the set builder were to purchase the panel on the open market. On the part of the set builder, the advantage lies in easier assem-

bly, uniformity of wiring and satisfactory operation, because all jobs are identical and any possibility of trouble has been eliminated at the time the original design is determined.

Medium Priced Receiver

In the medium priced market, the Halldorson interests are now merchandising their A. C. 56 receiver, which is described in the accompanying article. Two important considerations have been met by the manufacturer in that the operation of the set is simple, its cost is moderate, and its performance in keeping with the two previous attributes.

The receiver described uses the standard 226 alternating current tubes in the radio frequency stages and the first audio, while in the detector circuit the heater type of detector is employed. In the push-pull audio stages the 171-A has been used.

Looking at the photograph in Fig. 1, the reader will observe that the two radio frequency stages and the detector are placed in individual shielded cans so that there is no possibility of interaction between one stage and its neighbor. The coils are wound on small forms so as to limit the size of their field and make it possible for them to be placed inside of a shielded compartment. It will be noticed that the coils have been elevated from the bottom of the shield by means of a bracket to prevent any end losses. The sockets for the respective tubes in the shielded stage are a part of the steel base, but insulated therefrom.

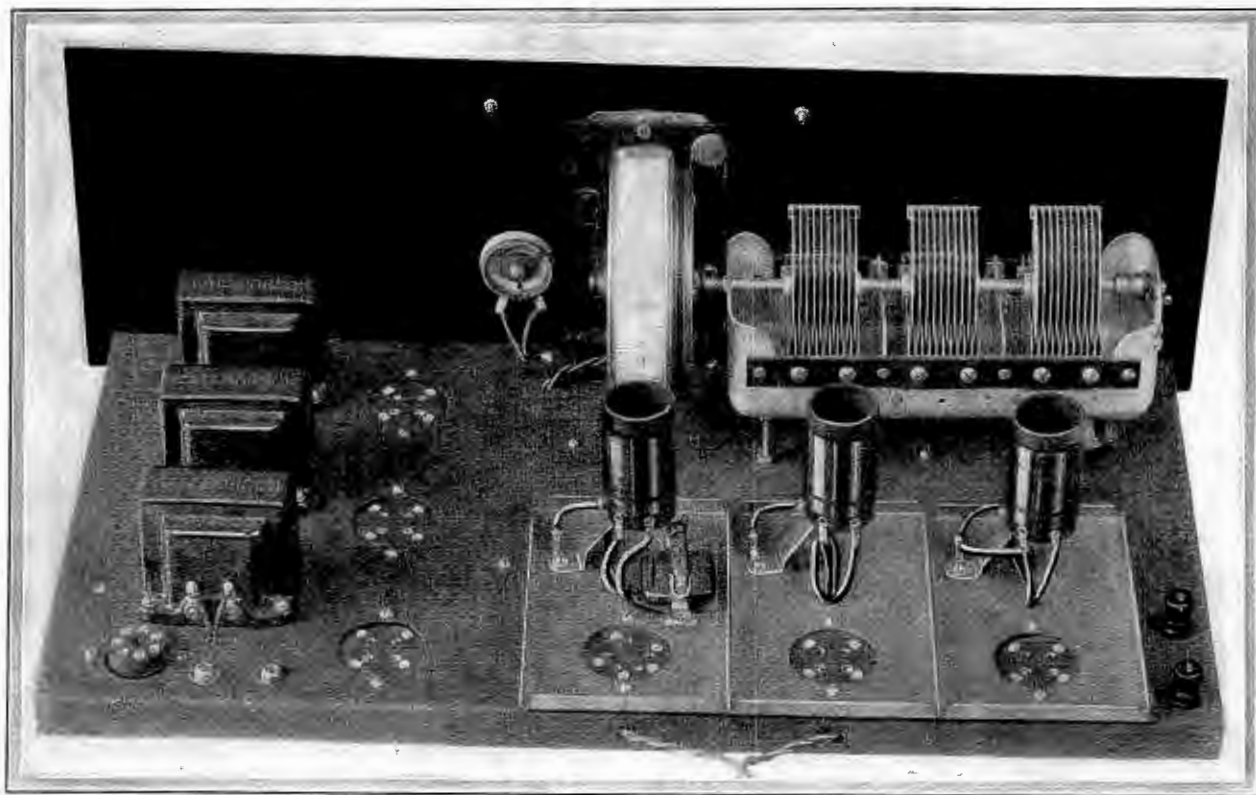


Fig. 1. All of the parts in the Halldorson A. C. 56 may be viewed in the above photograph, except the bypass condensers, filament resistors, etc., which are located under the steel base

(This receiver tested and all illustrations made in our laboratory)

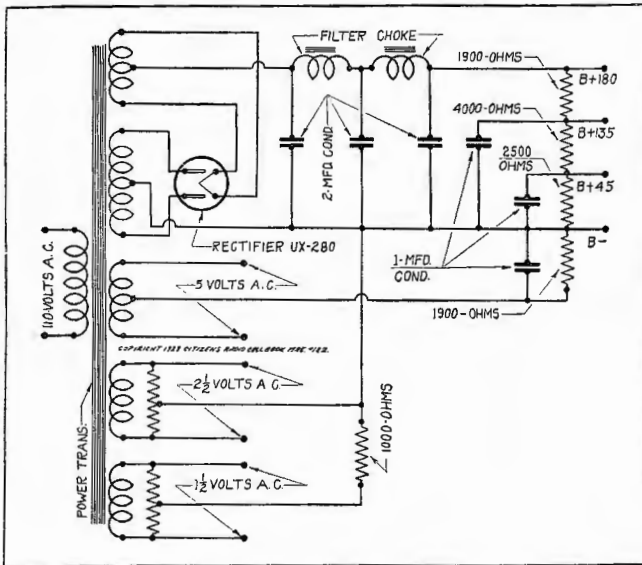


Fig. 2. A special power supply designed by Halldorson for operation of their A. C. 56 receiver is illustrated schematically above. Fixed resistances are used to give the three voltages necessary for the plates of the tubes, as well as the bias voltage for the push-pull stages and the r. f. tubes

While in the early model of this receiver, provision was made for a cable plug, nevertheless in the kits being merchandised at present the cable plug has been eliminated and instead a terminal strip is being employed to which all necessary wires are run.

Has Own Power Supply

In order to make sure of the operation of the receiver through the use of proper voltages, Halldorson has designed a small ABC power plant involving the use of a 280 type rectifier for the high potential circuit and three low potential secondaries, one of 5 volts a. c. for the 171 stages, another of 2 1/2 volts a. c. for the heater of the 227 detector, and the third low voltage winding of 1 1/2 volts for the filaments of the 226 tubes. The resistance network has a total of 8400 ohms, which is divided as follows: 1900 ohms between the maximum terminal and the 135 volt terminal; 4000 ohms between the 135 volt and the 45 volt terminals, and 2500 ohms between the 45 volt and the negative. Both the 45 and the 135 volt terminals are bypassed by 1 mfd condensers, while the maximum voltage has a 2 mfd filter condenser at the output end of the choke, another 2 mfd at the center tap of the filter choke and a third 2 mfd at the rectifier side of the filter choke. In the biasing circuit for the grids of the 171 power amplifiers, a 1900 ohm resistor is utilized between the negative B terminal and the center

tap of the 5 volt secondary. This resistor is also bypassed by a 1 mfd condenser. In the case of the bias required for the grids of the radio frequency tubes, and the first audio stage, a 1000 ohm resistor is located between the negative B terminal and the center tap of the 1 1/2 volt secondary. Thus, all biases on the tubes are automatic and in keeping with the plate and filament supply.

Set builders may readily determine the electrical characteristics of the receiver by consulting the schematic diagram in Fig. 4. As will be noted, energy from the antenna enters through the primary of the first radio frequency transformer, across which is located a 750 ohm variable resistance, which is used by the operator as a volume control. It is located in this position in prefer-

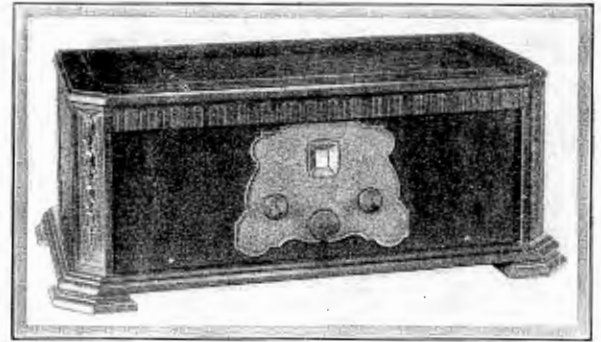


Fig. 3. In this photograph the receiver has been installed in a Fritts cabinet. The single knob at the lower center turns the drum dial for the r. f. stages. The left-hand knob governs the midjet condenser used as a trimmer across the first section of the three-gang condenser, while the right-hand knob regulates the antenna input by means of a 750 ohm variable resistance

ence to any other form of voltage control because the alternating current sets are quite critical to voltage control and thus the receiver may be operated with fixed voltages and the input from the antenna changed to suit the desires of the listener as to volume. The secondary of the first radio frequency transformer has across its extremities the first section of the .00035 mfd bathtub lengths or slight inequalities due to a changing antenna load, a small trimmer condenser is provided across the first section so that the three stages may be peaked as closely as possible. In order to stabilize the receiver in its operation, the grid circuit of the first radio frequency stage has an 800 ohm fixed resistor between the grid and the top of the secondary. This resistor is not in the tuned circuit and merely serves as a means of stabilizing the set.

Phono-Radio Switch

It is in the detector stage of the receiver that the phonograph-radio switch is located. This switch is of a single pole double

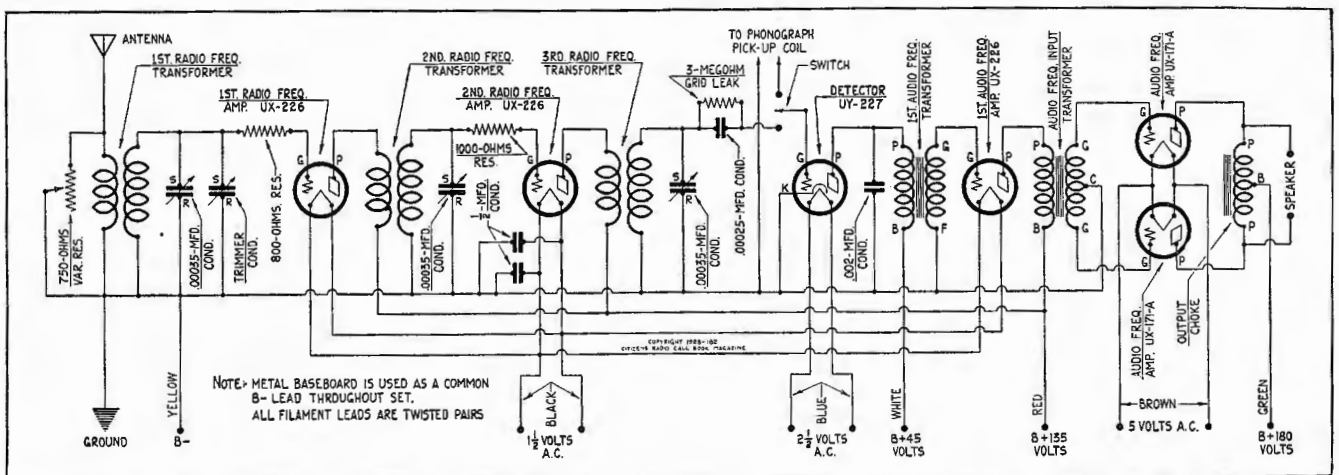


Fig. 4. All electrical details of the Halldorson A. C. 56 may be learned by consulting the schematic drawing illustrated above. It should be noted that the metal baseboard is used as a common B negative lead throughout

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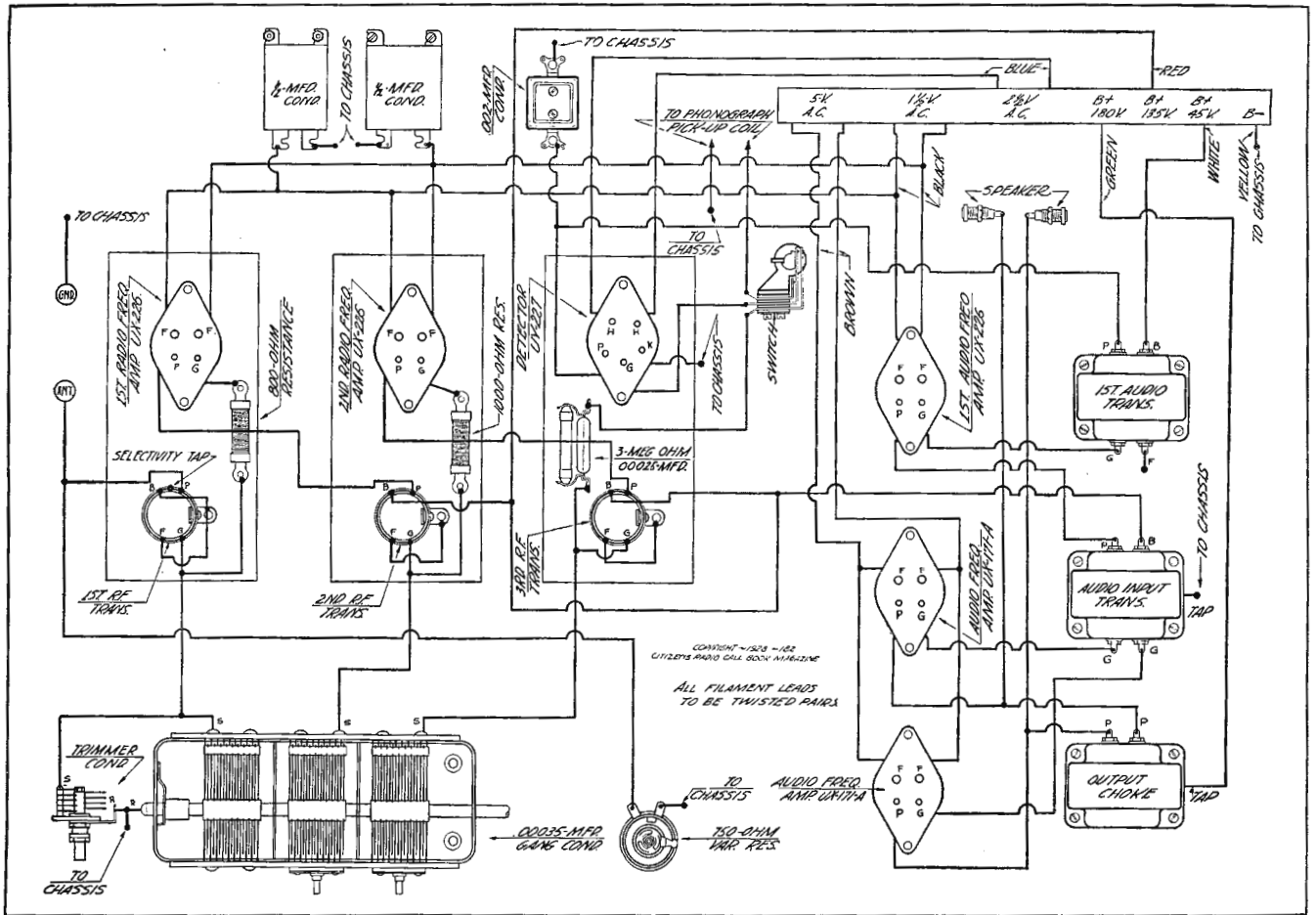


Fig. 5. Beginners in radio may easily wire up the Halldorson receiver from this simple graphic diagram, which shows where each wire should be connected, and in this particular case shows quite clearly the location of the component parts

throw midget type, whose center arm goes directly to the grid of the detector. One of the terminals of the switch connects to the grid condenser and leak, while the other terminal of the switch goes to one side of the phonograph pick-up coil, the other side of which goes to the negative B line. Thus, the phonograph pick-up may be thrown on by merely turning the switch.

Trim on Weak Signals

In the operation of the receiver, the drum dial should be rotated until a station is picked up in the vicinity of 70 degrees on the scale. Then the two small trimmers located directly on the bathtub, on the middle and right-hand sections, should be adjusted for maximum volume in the speaker. In doing this the operator should tune in a station with a fairly weak signal, as it is quite difficult to trim a condenser on a station having considerable volume. After these two stages have been trimmed, the midget trimmer condenser may be rotated back and forth to get the best results at that particular dial setting. In the event the receiver has any tendency to oscillate on the lower wavelengths, that is 15 or 20 degrees, it might be necessary for the operator to slightly retrim the two trimmers on the middle and right-hand section of the bathtub condenser.

In many locations where it is not possible for the set owner to have an outside aerial, he may resort to a wire carried around the picture moulding, or in some cases to the use of a Tobe light socket aerial, which will give quite satisfactory results in the absence of an outside antenna, for which, of course, there is no substitute.

Official Parts List

Parts used in the construction of the Halldorson A. C. 56 receiver are:

- 1 7x21 inch steel base

- 1 10½x20 inch steel sub-base with sockets and shield bases
- 2 Binding posts
- 1 .002 mfd condenser
- 1 .00025 mfd condenser
- 1 3 megohm leak
- 2 .5 mfd condensers
- 1 Drum dial
- 1 Escutcheon plate
- 1 Trimmer condenser
- 1 Volume control
- 3 R. f. coil brackets
- 1 Antenna coil
- 2 R. f. coils
- 1 3 gang .00035 mfd condenser
- 2 Grid resistors
- 1 Large knob
- 2 Small knobs
- 2 Speaker tip jacks
- 1 Push-pull input transformer
- 1 Output choke
- 1 Audio transformer
- 1 Phonograph switch
- 1 Terminal board
- 1 Connecting cable—10 wire
- 1 Coil hook-up wire
- 3 Copper stage shields
- 1 Package hardware
- 1 Package Kester radio solder
- 3 Ceco or Sonatron 226 tubes
- 1 Ceco or Sonatron 227 tube
- 2 Ceco or Sonatron 171A tubes

Thordarson 210 Power Amplifier for Use on Most Any Receiver

Automatic Grid Bias Is Furnished by the Unit; Glow Tube Employed; Metal Panel Is Punched

SIMPLICITY of assembly of the recently announced Thordarson 210 amplifier and plate supply should allay the fears of the home constructor who has hesitated in building his own amplifier because of the intricacies of construction. The metal base which accompanies the kit is equipped with all sockets and binding posts mounted, all mounting holes drilled, and includes an insulating wiring template to facilitate assembly. The special power input plug, which fits into the last audio socket, removes the necessity of changing the wiring of the receiver to accommodate the power tube.

The supply itself is of the conventional type using a transformer contained within a metallic housing, this transformer having the regular 110 a. c. primary and three secondaries, the first of which is for the filaments of the 210 tube, the next for the filament of the 281 rectifier tube and the third secondary, being high voltage one, for supplying the 281 rectifier. A double choke is included inside the housing and serves to filter out any ripple present in the supply.

A typical condenser block, such as the one made by Tobe, is used across the two extremities of the rectified output. Inside of this condenser block are also located three smaller condensers, one of 4 mfd which goes across the G and plus terminals of the glow tube socket, one of 1 mfd capacity which goes across the 45 volt and negative terminals of the resistor and the last 1 mfd which goes across the B-135 and negative terminals of the supply. Plate current for the 210 power tube is taken from a connection at the output end of the filter choke, since this particular power tube takes approximately 400 to 425 volts. Bias resistance for the grid of the 210 is a 1000 ohm unit located between the center

tap of the filament winding for the 210 tube and the common B negative terminal of the power supply. Four binding posts are provided in the assembly, these being for B negative, B-45, B-90 and B-135 volts.

Resistor Mounting

The grid terminal of the 210 tube goes to the grid connection of the last audio socket in the receiver, with which the power supply device is being used. The resistors used in the circuit are special ones supplied with the kit and mount vertically between the 210 tube and the R-76 output transformer, as is shown in Figure 1. The secondary of the output transformer goes to the speaker, regardless of whether it is a dynamic or a conventional cone.

Uses Glow Tube

In order to maintain the 90 volt terminal at a stated voltage, one of the type 874 voltage regulator tubes is recommended and provision has been made on the panel for this glow tube.

On account of the compactness of the unit, it may be placed inside of a console, although some allowance should be made for ventilation on account of the rectifier and amplifier tubes furnishing quite a bit of heat in the enclosed space. The presence of too much heat inside of the console might cause the drying out of the wood and possibly warping.

The power compact may be used on any receiver requiring three intermediate voltages and a maximum voltage. The presence of the voltage regulator tube in the circuit insures that 90 volts will always be available at that particular tap regardless of the line conditions or regardless of the current drain of the receiver, except in the case of a set using more than twenty milliamperes from the 90 volt terminal.

Official Parts List

The parts used in the construction of the power compact are as follows:

- 1 Thordarson high voltage transformer
- 1 Thordarson R-76 output transformer
- 1 R-508-3445 fixed resistance kit
- 1 Thordarson R-211 metal sub-panel
- 1 Thordarson R-172 power input plug
- 1 Tobe 210 filter condenser block
- 1 Package Kester radio solder
- 1 Ceco or Sonatron 281 rectifier tube
- 1 Ceco or Sonatron 210 power amplifier tube
- 1 874 voltage regulator

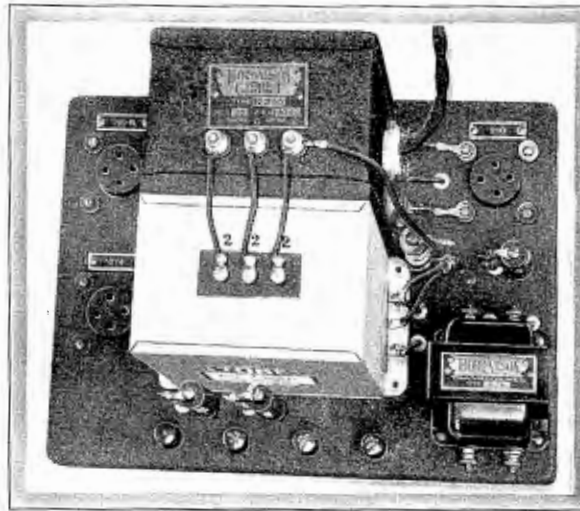


Fig. 1. This photograph shows the top rear view of the completed compact after it has been assembled and wired by the builder

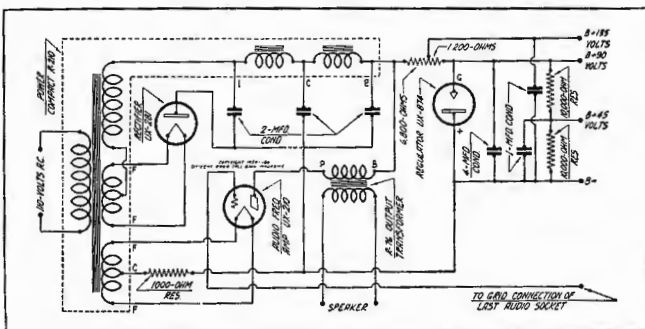


Fig. 2. The schematic circuit above should enable the builder to see all the necessary connections that have to be made for wiring up the compact

(This power supply tested and all illustrations made in our laboratory)

Tyrman Imperial 80 Is Designed for the Custom Built Trade

Self-Contained A B C Power Supply on Subpanel Makes Set
Ideal One for Easy Demonstration

ALL parts designed to co-ordinate and interlock with each other, creating in the final assembly an a. c. operated receiver unequalled for selectivity, sensitivity, stability, power and tone, is a brief description of the Tyrman Imperial 80 using a. c. shield grid tubes and now being merchandised for the custom-built trade.

Chassis Ready Punched

The chassis of the receiver is of heavy gauge steel, cadmium plated. It is formed and punched to automatically accommodate all units to be mounted upon it. Underneath the steel chassis is a bakelite subpanel arranged so that all contacts due to be insulated from the chassis are held away from it and terminals to be grounded are allowed to touch it. This makes the wiring of the receiver extremely simple and practically fool-proof.

Power supply of the receiver is designed solely for the Tyrman 80 and is an integral part of the chassis. It is mounted on a steel

platform with four screws directly back of the other apparatus in such a position as to have no inductive or magnetic coupling with the audio units. It is rated at 100 milliamperes of current at beyond 400 volts. The power supply also furnishes filament current for operating the seven heater type filaments in the type 27 and 22 a. c. tubes. It is simple to install, as it is only necessary to connect the colored wires and the cables furnished with the pack to their respective positions. There are no adjustments, the supply unit being completely assembled at the factory.

Peaked at 475 KC

The intermediate transformers in the receiver operate at a frequency of 475 kilocycles, assuring one spot reception on the oscillator dial. These four intermediate transformers are especially designed for the particular position in the circuit where used. The transformers are different in number, and although

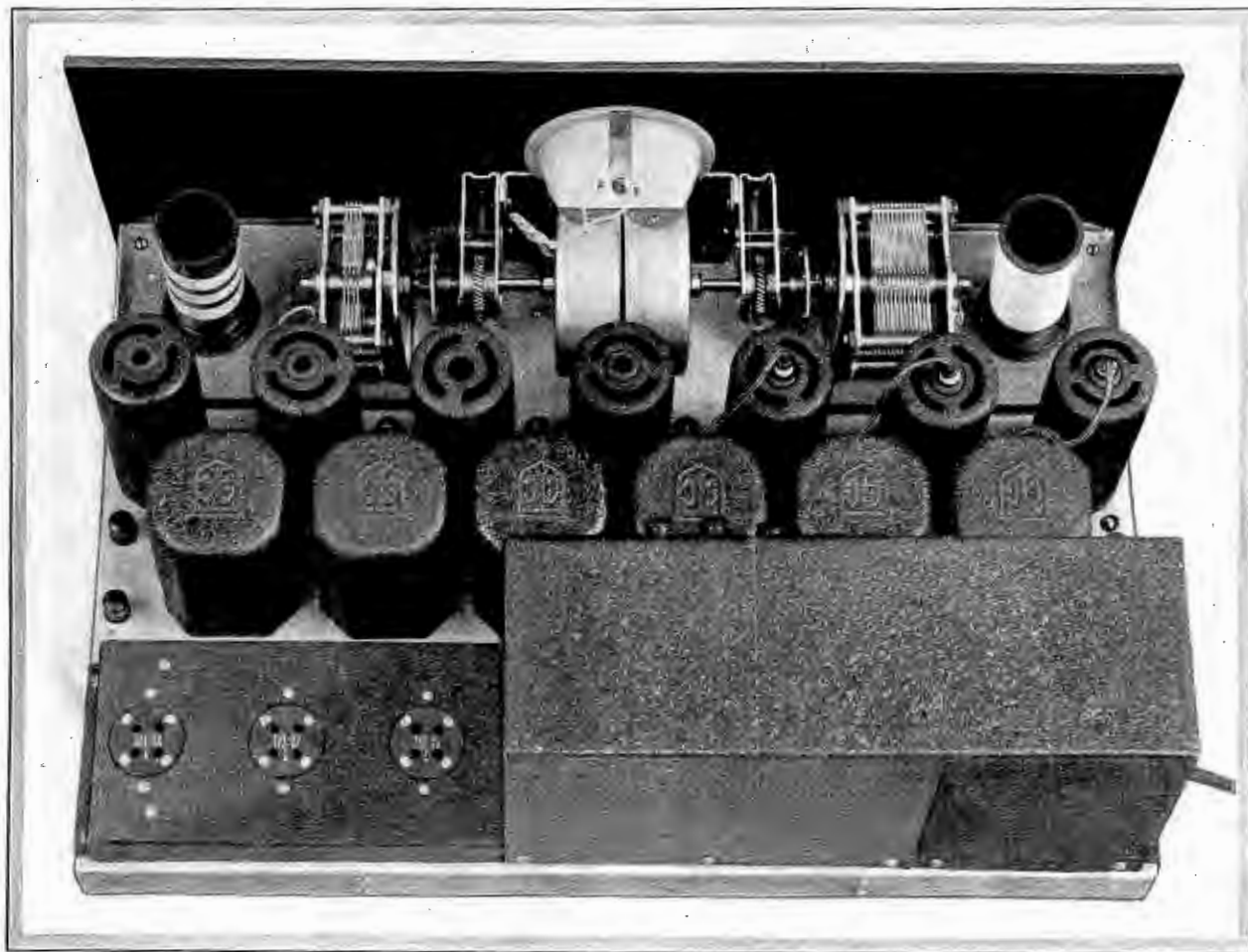


Fig. 1. Simplicity of lay-out and symmetry of design are two of the features disclosed by the above photograph of the Tyrman 80. The three sockets at the left rear in the photograph are for the rectifier tubes and one power tube, either of the 250 type or of the 210

(This receiver tested and all illustrations made in our laboratory)

each one is peaked at a different frequency, it is important that they be placed in their respective positions in order to insure proper operation.

Volume control on the receiver is by means of the 75,000 ohm variable resistance shown in the schematic diagram Fig. 3. This resistance affects only the bias on two of the intermediate stages and does not alter the peaking of the intermediates.

The climax of the Tyrman audio coupler system is expressed in the application of either the 210 or 250 power amplifier tube for the second audio stage. Either of these tubes is adapted as standard for the Imperial 80, the former giving maximum volume with slight distortion and the latter giving maximum tone quality at a slight sacrifice of volume.

Provision is made in the receiver to permanently connect a phonograph pick-up unit, which enables changing from radio to phonograph record reproduction by simply turning the switch on the front panel.

Short Wave Plug-In Coils

For those interested in short wave reception, a subject which is now attracting the attention of almost every experimenter and fan, the Tyrman receiver permits the use of two complete sets of short wave coils which may be conveniently and easily plugged in in order to cover the lower wave bands for experimental or entertainment purposes.

The front panel of the receiver is 8x21 inches and the subpanel is 3½x20½ inches. All parts are beautiful black crystal finished and are mounted on a cadmium plated platform. The front panel of the receiver is genuine wood, solid walnut, impressed on steel by a special process. A concave window reflector fits into the panel encircled by a rich bronze plate illuminating the dial strips of the worm drive drum. Three matched control knobs and two toggle switches add balance that gives pleasing symmetrical appearance to the panel.

Bias for All Stages

Aside from the bias supplied the first and second intermediate frequency amplifier by means of the 75,000 ohm variable resistance bias for the third and fourth intermediate transformers is furnished through the drop across an individual 3,000 ohm fixed condenser between the cathode of the tubes and ground, the resistor being amply bypassed. The same method of biasing is employed in the four intermediate frequency transformers which is the second detector stage where a 227 type tube is used. In the first audio tube this same method of biasing is utilized. No bias is provided for either the first detector or the oscillator, both of these tubes being of the heater type. Bias for the 250 or 210 power tube is obtained by the drop across the 1250 resistance between the center tap of the filament winding for that particular tube and the ground connection.

Magnetic or Dynamic Speaker

In the power supply, in addition to the double filter choke, there is provided an audio frequency choke around which is placed the speaker winding, regardless of whether of the magnetic type or the dynamic. In the illustration shown in Fig. 3 the upper block represents the manner in which the jumper connection should be placed for the use of a regular speaker, while the lower block indicates the method used in placing a jumper for the employment of a dynamic speaker. Actually in the set there is only one terminal block. This explanation is made so as not to confuse the reader. This may also be seen by referring to the diagram shown in Fig. 2, where there are two speaker terminals and three binding posts. A jumper is placed from 1 to 2 when using the dynamic speaker and placed from 2 to 3 when using the regular magnetic speaker.

The schematic circuit in Fig. 3 also shows the phonograph pick-up connection, the plate of the second detector going to one

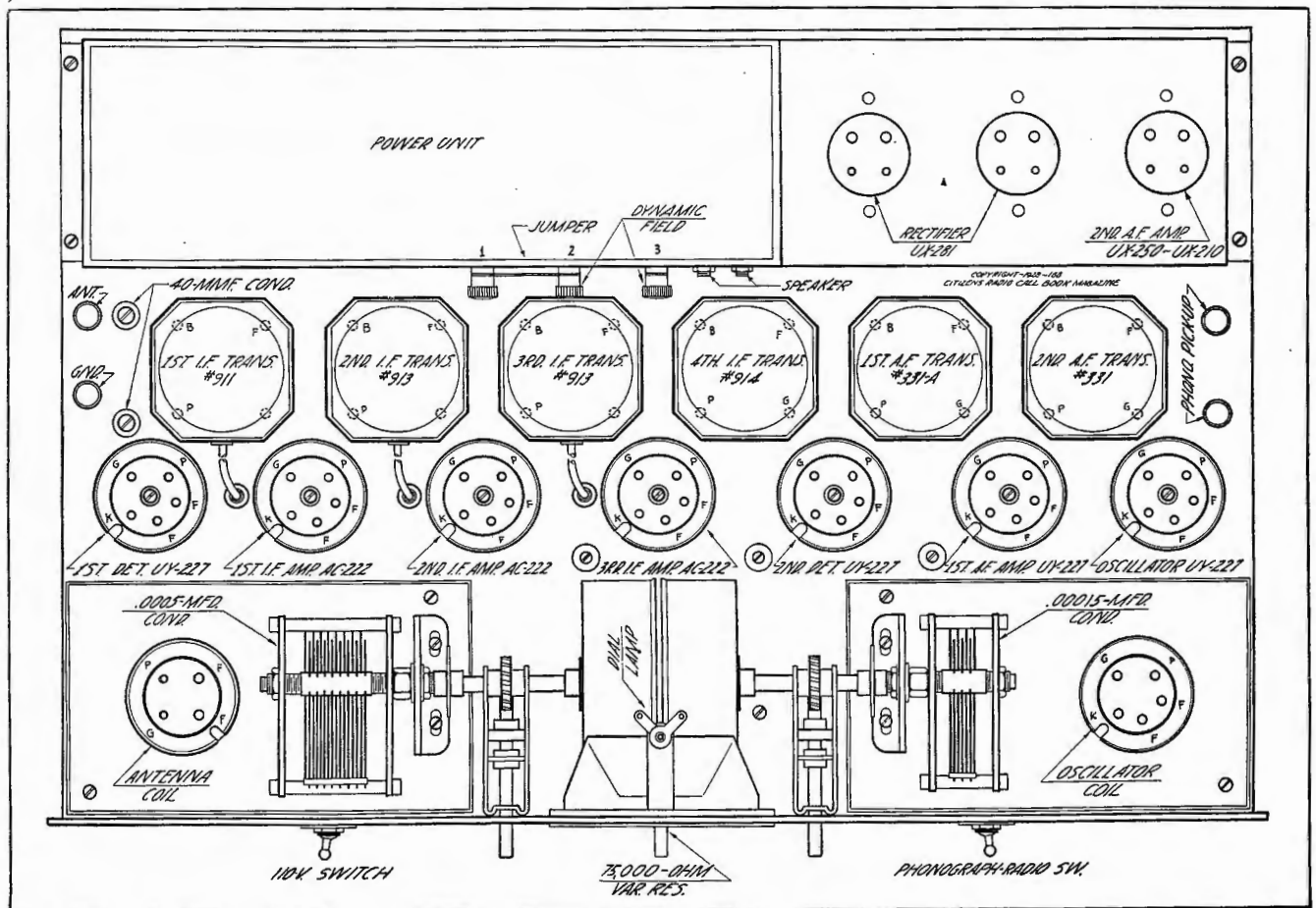


Fig. 2. The illustration printed above gives an idea of the exact lay-out of all parts in the receiver. By following this diagram for the laying out of the parts and the illustration in Fig. 4 for the wiring considerable time may be saved

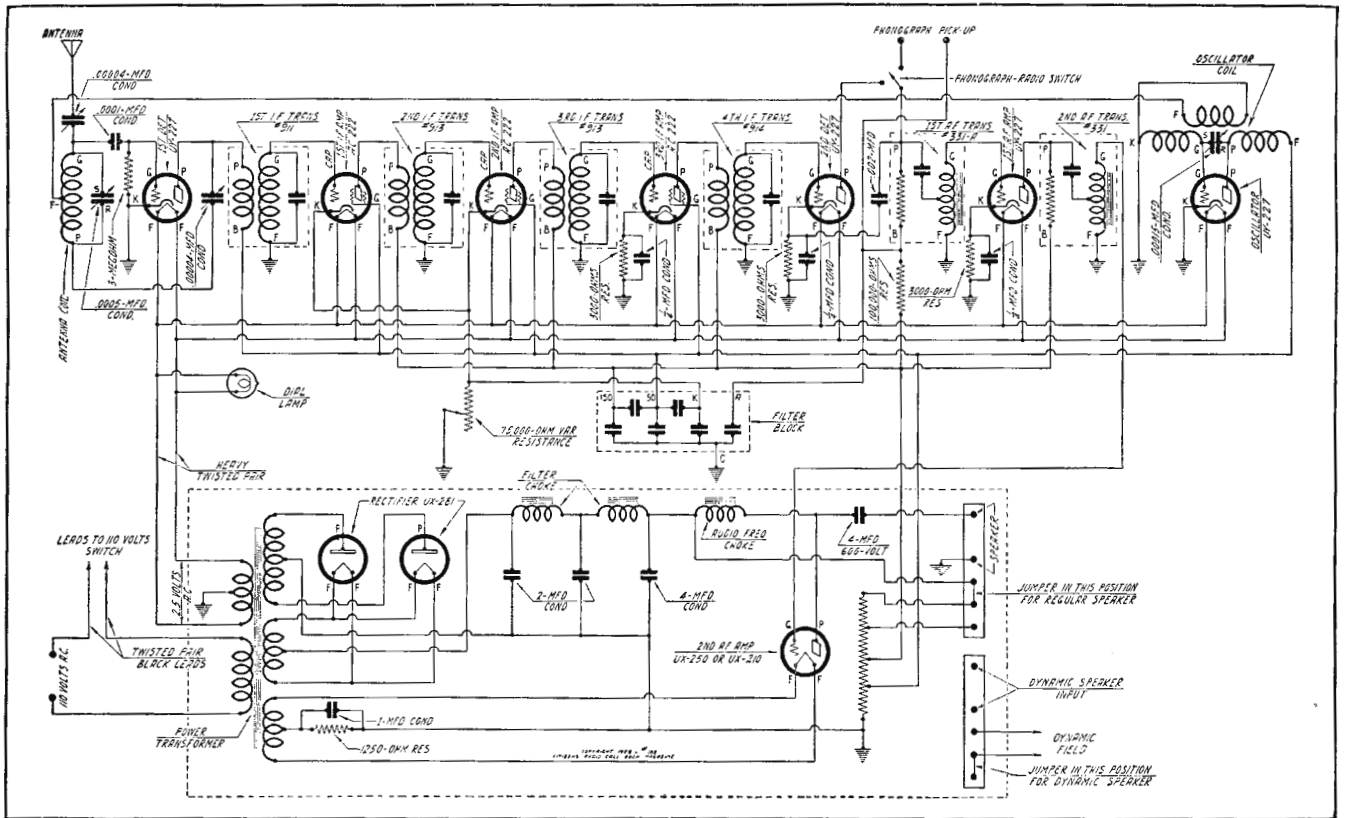


Fig. 3. The schematic circuit of the combined receiver and power amplifier is shown in the above drawing

of the contacts of the switch and the other contact going to one audio transformer 331 A goes to the center arm of the phono- (Continued on page 142)

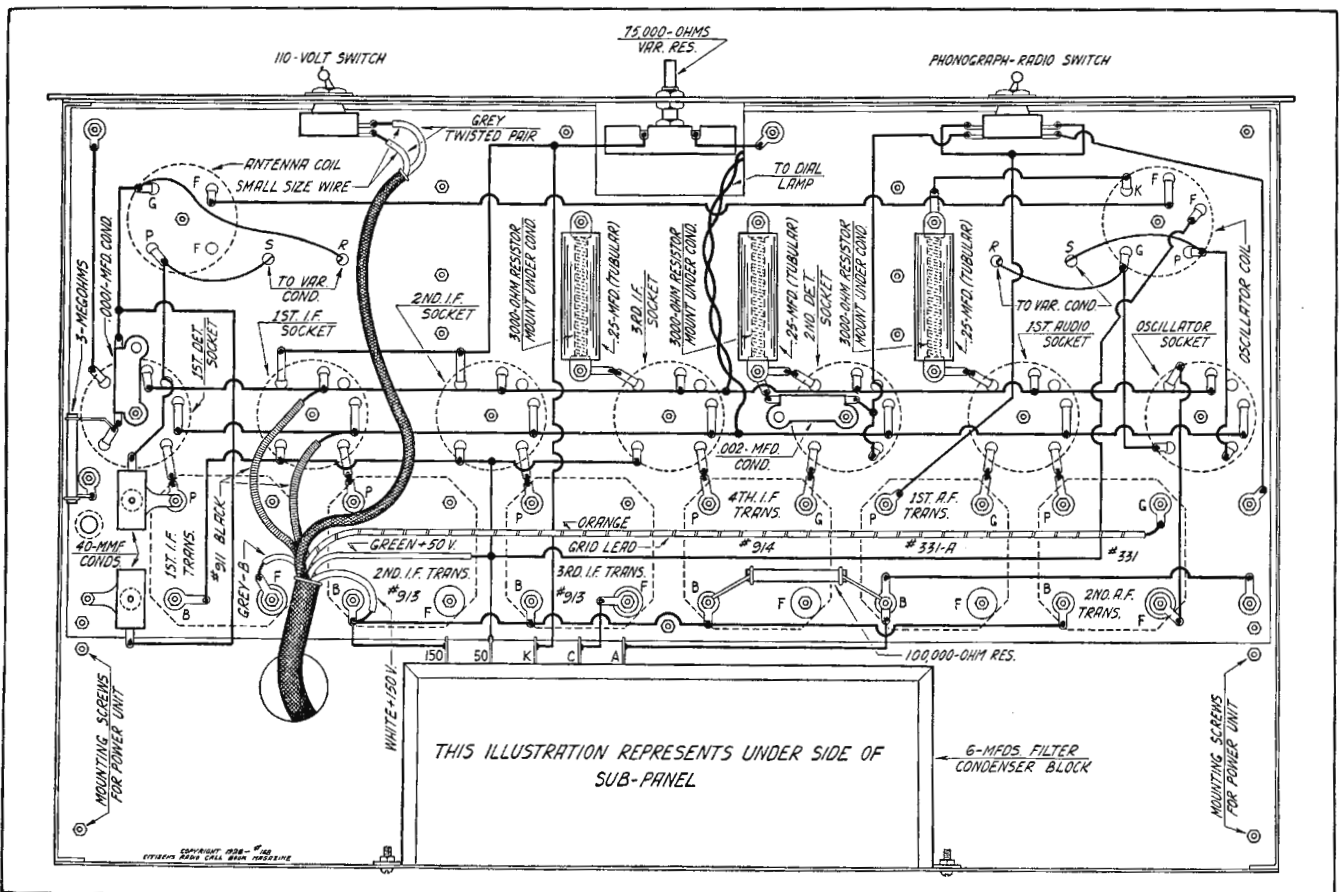


Fig. 4. After all parts of the receiver have been placed in position, it may be turned over and wired from the underside

Hammarlund-Roberts HI-Q 29 Master Model Has Band Pass Filter

Simultaneous Tuning of Grid and Plate Circuits Is Responsible for Set's Selectivity

EMPLYING shield grid tubes in a circuit especially developed for these tubes by the engineering departments of ten nationally famous parts manufacturers, the Hammarlund Roberts "Hi-Q 29" master model receiver should furnish sufficient proof to convince the most skeptical that the best in radio must be custom built. Made of the finest parts available on the market, this new receiver is essentially de luxe in design, appearance and operating qualities. Its primary purpose is to more than meet the demands of the most critical regardless of the number of tubes used and regardless of price. There are two models of this particular receiver, one being the a. c. model, which makes the receiver an all-electrical radio, ready to plug in the light socket. All constructional and operating characteristics are identical with the battery operating model, although, of course, the wiring is different.

D. C. Model

The d. c. model described in the accompanying article has a complete chassis with an engraved walnut panel to fit any standard cabinet designed for a receiver with all-over dimensions of 7x12x24 inches. The tubes employed in the d. c. model are two screen grid 222s, two 201A type, and one power tube of the 171 type.

An inspection of the photograph in Fig. 1 will disclose the lay-out of the parts and show the three shields housing the two

stages of tuned radio and the tuned detector. In the photograph the tops have been left off the shields.

Uses Pierced Chassis

The design in Fig. 4 shows the exact baseboard lay-out of the receiver, whose assembly is simplicity itself because the sub-panel is already pierced for each integral unit. For those who are not accustomed to working from a schematic circuit, the receiver may be wired by consulting and following all connections shown in Fig. 3. The professional set builder will be able to wire such a receiver from the schematic diagram in Fig. 5. Fig. 2 shows a front panel view of the receiver after it has been mounted in the cabinet.

The circuit employed makes use of two shield grid tubes working at maximum efficiency, followed by a standard detector and a two-stage transformer coupled audio amplifier. The special tuned grid tuned plate circuits used in the radio frequency stages are primarily responsible for the excellent pick-up of the receiver and to attendant selectivity. These stages are in reality band-pass filters, both plate and grid coils, in each stage being tuned to exact resonance by separate variable condensers.

This highly efficient circuit makes it possible to utilize a much higher proportion of the theoretical amplifying properties of the screened grid tube than any other method. In addition the filter type of circuit has the added advantage of providing extreme

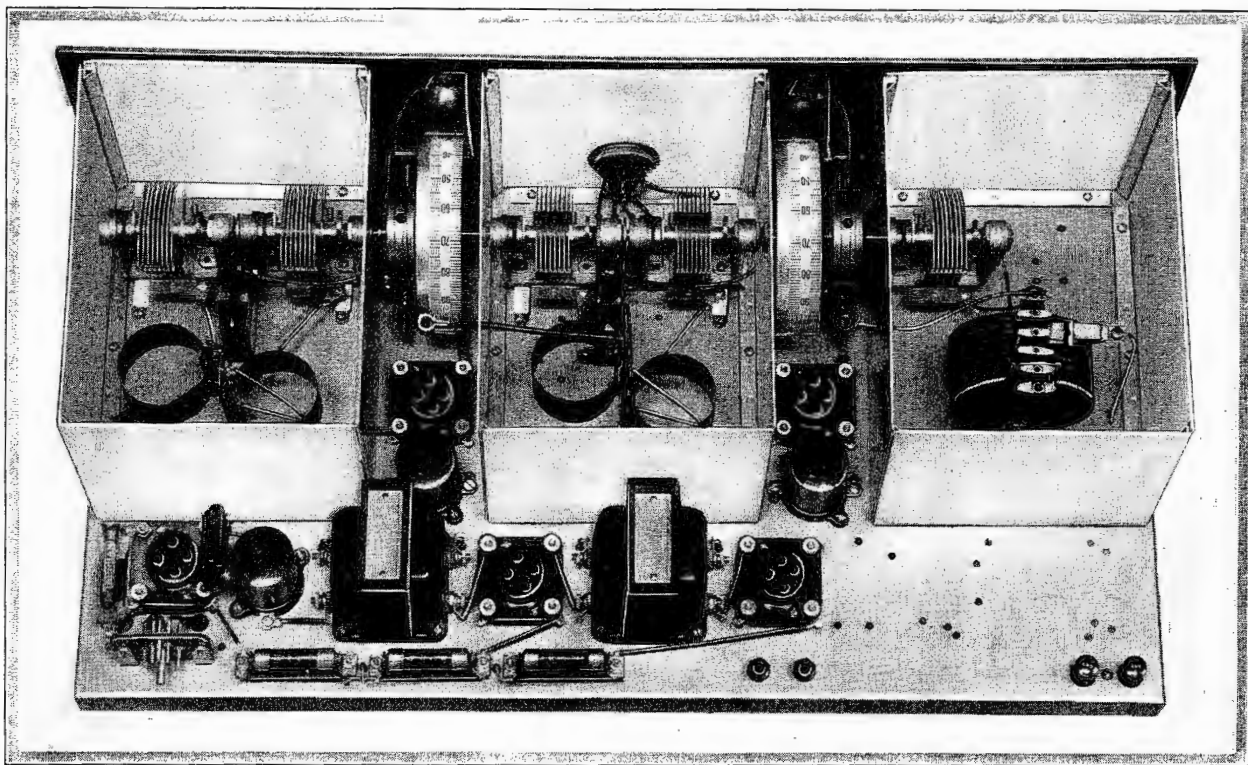


Fig. 1. This photograph shows the trimness of the Master receiver described in the accompanying article. The chassis is pierced for any of the three or four models being marketed this season by Hammarlund-Roberts

(This receiver tested and all illustrations made in our laboratory)

selectivity heretofore unobtainable without the excessive cutting of side bands with its attendant loss of quality. The shape of the tuning curve closely approaches the flat top sharp cut-off curve long considered ideal by radio engineers.

Individually Shielded

Each stage is individually and completely shielded by special shields designed particularly to eliminate any current losses and preserve the desirable low resistance properties of the circuit. All parts are mounted on a ready drilled cadmium plated steel chassis with welded corners and of heavy construction. The tuning controls consist of two illuminated drum dials, one used as a separate control for the antenna coil and the other to tune the two filter stages.

An examination of the photograph in Fig. 1 will show the two identical inductances used in the grid and plate circuit of the screened grid tubes. Each of these identical coils is tuned to resonance with the desired signal by means of a .00035 mfd variable condenser. Due to the rather unusual mounting arrangement, the mutual inductances and coupling between primary and secondary is very small, which, however, does not affect the energy transfer from primary to secondary. Due to the inherent characteristics of loosely coupled tuned circuits each of these doubly tuned radio frequency transformers really constitutes a bandpass filter, the use of two such stages in cascade resulting in an unusual degree of selectivity.

Individual Biases

The grid bias for each individual screened grid tube is supplied by the drop across the ten ohm fixed resistor in the negative leg of each filament. In the case of the detector, of course, the bias is to the positive side of the filament circuit. Each of the screened grids has a five thousand ohm fixed resistor, properly bypassed, located in series with the supply line, which is the arm of a 100,000 ohm potentiometer, the two extremities of which are

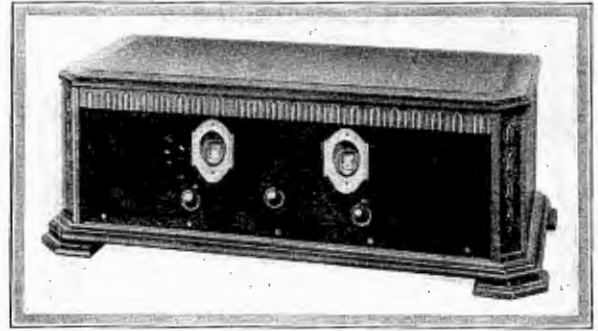


Fig. 2. In this photograph the receiver has been placed in an attractive cabinet. The knob at the extreme left is the drum for the single variable, the knob in the center is the combined filament switch and 10,000 ohm potentiometer, while the knob at the right controls that of the four single condensers ganged

across the ground and the positive 45-volt terminal of the battery or eliminator. The varying of the position of this arm will increase the voltage applied to the screened grids. The 100,000 ohm potentiometer has been purposely made a high value so that in the event that the receiver is used with dry B batteries there is practically no discharge between the 45-volt positive and negative terminals. However, where the set is to remain unused for any length of time, it would be best to break the negative B wire from the battery so as not to permit any discharge across the 100,000 ohm potentiometer. In the a. c. model, of course, this does not make any difference, since when the eliminator is turned off all voltages disappear.

The audio end of the receiver is conventional and uses two Thordarson R 300 audio transformers. In the d. c. model described in this article, no provision has been made for an output trans-

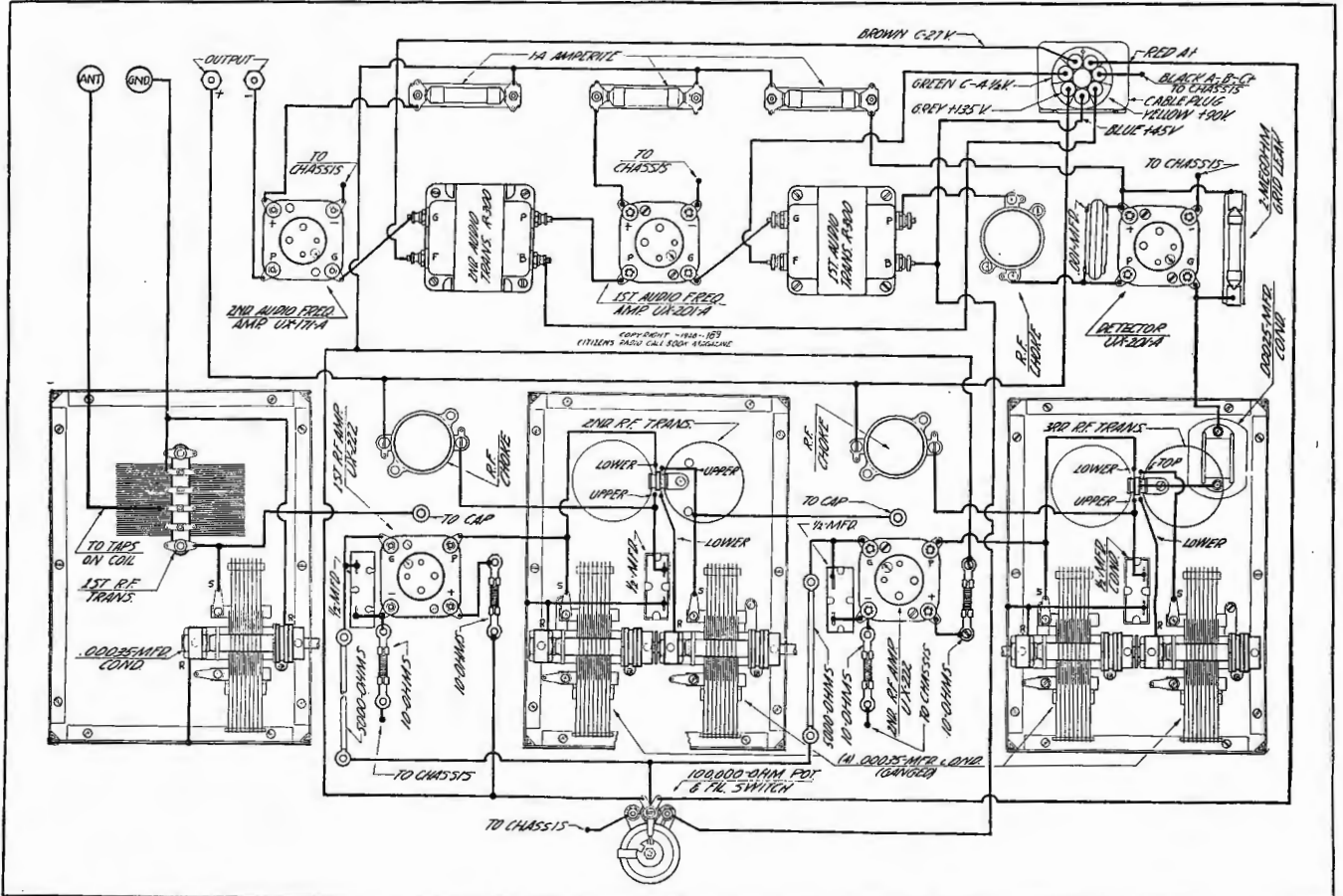


Fig. 3. Simplicity of the wiring in this interesting receiver may be seen by inspecting the graphic illustration shown above

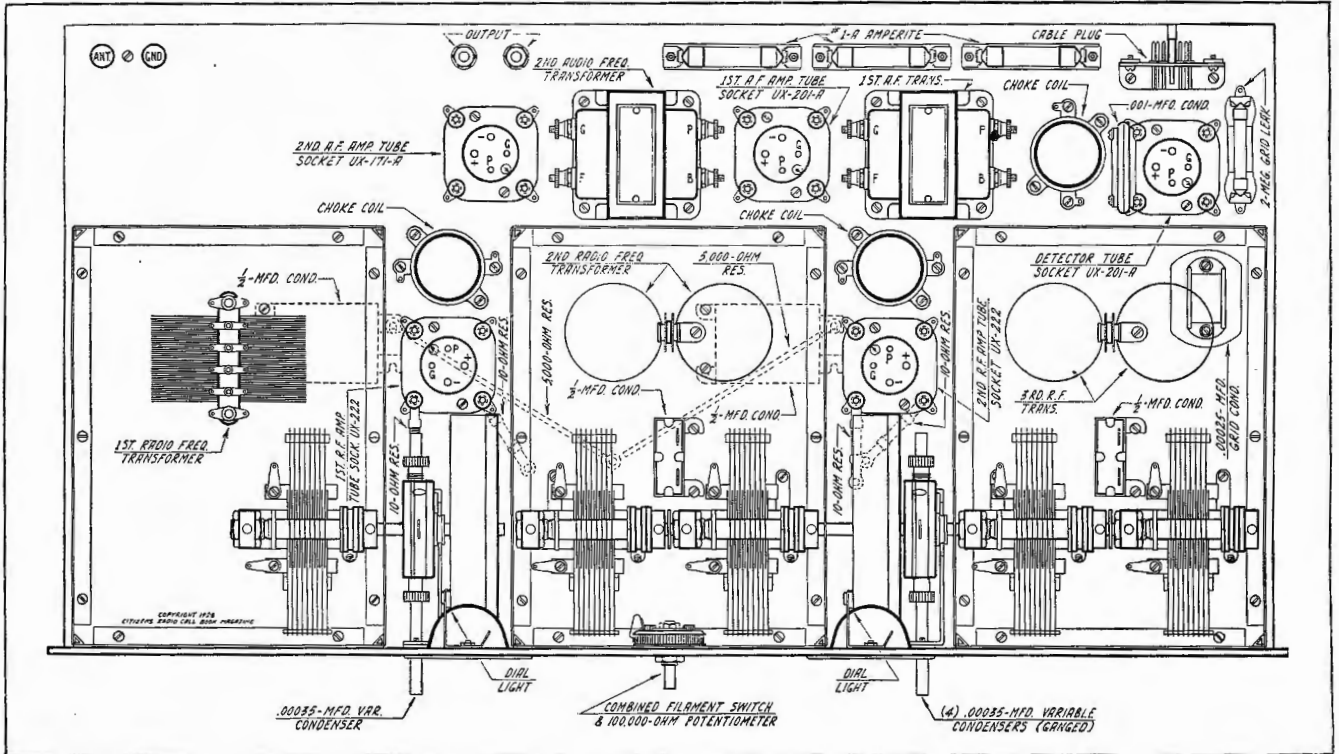


Fig. 4. All parts for the Master model should be laid out in accordance with the baseboard drawing reproduced herewith

former, since it was felt that the set might be used directly with a dynamic speaker which already has its own input transformer. However, if a separate output transformer should be required, it is connected across the plus and minus terminals of the output shown in the schematic circuit in Fig. 5.

Official Parts List

Parts required for the construction of this receiver are shown in the accompanying list:

- 5 Hammarlund No. ML-17 .00035 mfd Midline condensers
- 1 Hammarlund No. HQ-29 coil set
- 2 Hammarlund No. SDW knob-control drum dials (walnut)
- 3 Hammarlund No. RFC-85 radio frequency chokes
- 5 Benjamin sockets, No. 9040
- 1 Sangamo .00025 mfd fixed mica condenser
- 1 Sangamo .001 mfd fixed mica condenser
- 1 Carter No. 11-S "Hi-Pot" potentiometer with switch, 100,000 ohms

- 2 Thordarson No. R-300 audio transformers
- 4 Parvot .5 mfd Series 200 bypass condensers
- 1 Durham metallized resistor, 1½ megohms
- 1 Yaxley No. 660 cable connector and cable
- 1 Pair Yaxley No. 422 insulated phone tip jacks
- 2 Amperites No. 1-A
- 1 Amperite No. 112
- 2 Eby engraved binding posts
- 1 "Hi-Q 29" master foundation unit (containing drilled and engraved panel, three complete aluminum shields, drilled steel chassis, shafts, binding post strips, Fahnestock clips, fixed resistance units resistor mounts, brackets, clips, wire, screws, nuts, washers, and all special hardware required to complete receiver)
- 1 Package Kester radio solder
- 2 Ceco or Sonatron 222 tubes
- 2 Ceco or Sonatron 201-A tubes
- 1 Ceco or Sonatron 171A tube

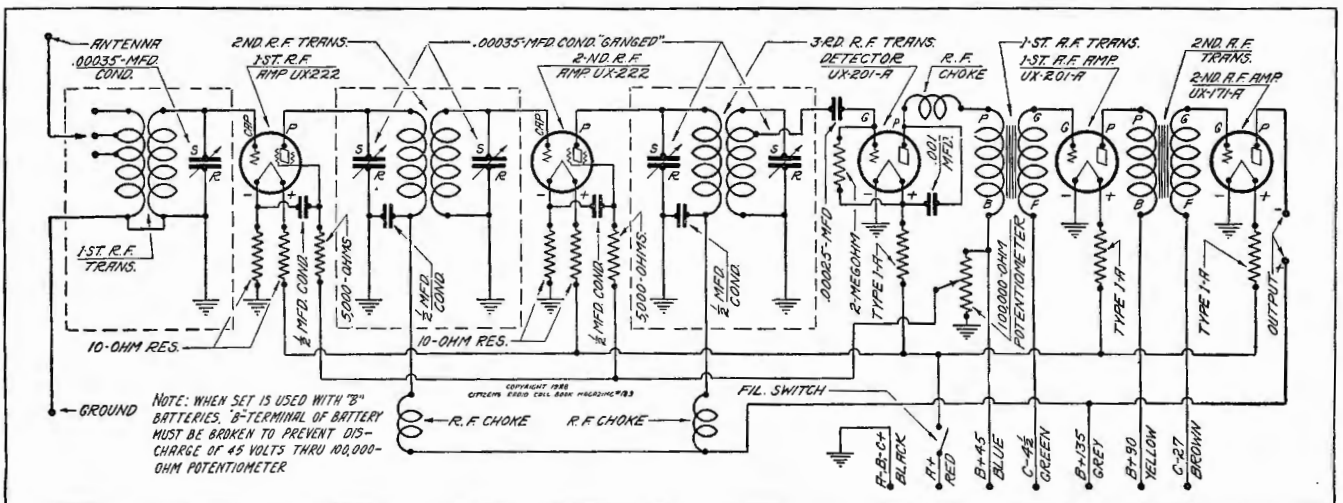


Fig. 5. The electrical circuit of the receiver is shown in the above schematic diagram

Tunable Intermediate Transformers in New Lincoln 8-80 Super

Screen Grid Amplification and High Ratio Audio Using Clough System Are Features

SINCE the advent of the screen-grid tube much thought has been given to receiver design with the primary motive of bringing out as much of the available power which this type of tube is known to possess. With this point in view the Lincoln Radio Corporation started the development of a radically new system of transformer coupling especially adaptable to the screen-grid tube.

This new receiver known as the Lincoln 8-80 has far exceeded the expectations of the designer in stability, amplification, selectivity and lack of all of the detrimental features in the super circuit which have always been considered as a necessary evil.

At first it was hard to realize that small 250 watt stations a thousand miles distant were not really local stations so realistic were they reproduced in the speaker. New York, Pittsburgh, Texas, Colorado and many other stations could be brought in through the barrage of Chicago local stations without a degree of interference and with good volume above the static level. Oscillation was entirely absent and selectivity well within 10 kc. Stations 300 to 400 miles distant could be played at noon on a hot summer day without antenna. This unusual performance is directly due to a new system of screen-grid tube i.f. amplification and augmented by high audio amplification possible without distortion.

Whole Design Changed

In the original design of the Lincoln 8-80 standard parts were

first used hoping that corrections could be made to overcome the many detrimental features found so common in super circuits, but it was found to be a hopeless task. It was then decided to start from the ground up and different systems of tube r.f. coupling were tried without any decided advantage being noticeable until the present i.f. transformer was finally conceived, built and put on test. At once a very decided increase in amplification was noticeable, oscillation disappeared, exceptional selectivity and sensitivity was noted. The intermediate frequency chosen allowed for "one spot" reception on all stations above 222 meters. Harmonics from stations below 222 meters only appeared on the opposite end of the oscillator dial so that absolutely no confusion would arise and receiver would be "one-spot" registration.

To counteract the unstable conditions found in intermediate amplifiers in the past causing squeals, howls and oscillation, the Lincoln intermediate transformers were carefully built as uniform as possible, but no attempt was made to match them in the laboratory. This operation was left until the receiver was built and put into operation. Small variable condensers were incorporated into the top of the transformer, tuning the plate winding. An easy adjustment of this small capacity compensated for all tube reactions and capacities which heretofore had produced a variation of peak frequencies in the different intermediate stages, and in this manner a perfect filter system was created irrespective of what tubes are used or how the set is built.

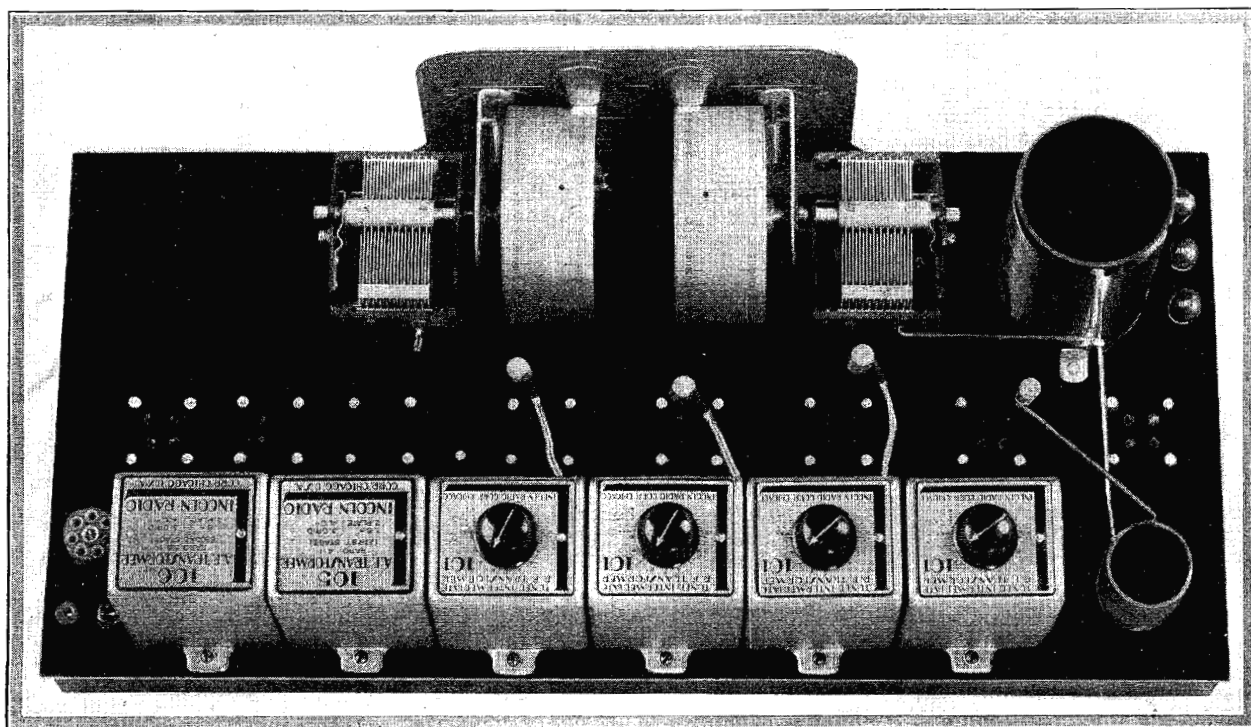


Fig. 1. This photograph shows the top and rear of the Lincoln 8-80 described in this article. The midget condensers, by means of which the intermediate stages are tuned by the operator, are shown at the top of the No. 101 intermediates. The tops of the intermediate cans bear numbers so that when tuning the stages the operator may set the arrows of all stages at the same point

(This receiver tested and all illustrations made in our laboratory)

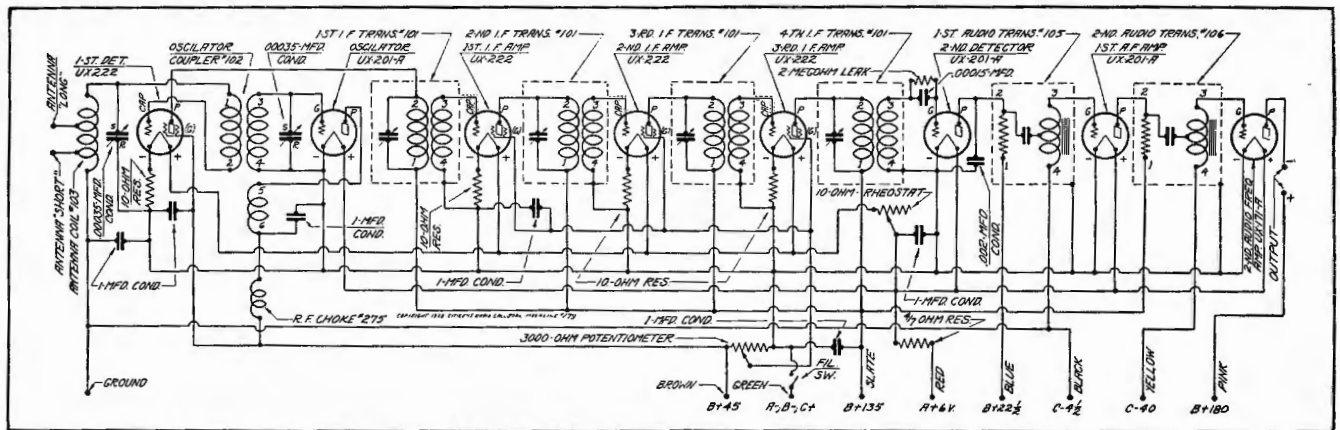


Fig. 2. Schematically the circuit involved in the Lincoln Super is shown above. The input stage, which was designed for use with antenna, has two taps, one for a short antenna and the other for a long aerial. The 3000 ohm potentiometer shown in the diagram regulates the potential applied to the screen grids of the tubes

Turn Ratios

The new system of transformation is composed of primary and secondary windings placed on a molded bakelite form which in turn is encased in a heavy copper shell. The primary windings are composed of 350 turns of No. 37 enameled wire uniformly wound. Inside of the bakelite shell is incorporated another bakelite tube on which 150 turns No. 37 enameled wire composes the secondary winding. The primary winding is tuned by a small variable midget condenser and by this arrangement high impedance is placed in the plate circuit of the screen-grid tube to which is added the reflected impedance of the secondary winding, creating a very high tube amplification. Frequency of this intermediate transformer can be changed readily and accurately by an adjustment of the small tuning condenser across the primary.

It is obvious that each transformer can be tuned to peak efficiency right in the set, whereas it is practically certain that factory matching and pre-tuning cannot adequately allow for variations in individual sets, tubes and other variable factors. These tunable transformers eliminate the oft heard complaint that one super is a "wow" and an apparently identical copy using similar factory matched transformers is a decided "flop." The net result of this improved system was so different from the average super performance that one would realize at once that something radically new had been incorporated into the Lincoln 8-80—selectivity was well within 10 kc. and tonal quality seldom before heard in a super receiver. Matching of the intermediate stages could be done in just a few minutes (this operation once done, no more attention need be paid to same until different tubes are used). Any intermediate frequency may be chosen simply by changing all four of the transformer adjustments from 350 to 550 kc.

Uses Clough Audio

Not only were the above features considered, but careful thought was given to the complete registration of musical frequencies in the audio end. The Clough system of audio amplification was adopted. The transformers used in the first and second stages differ from each other in the value of plate resistance and in effective transformation ratio. These two transformers are hermetically sealed in copper cases exactly similar to those housing the i.f. transformers. These a.f. transformers are really fine instruments for, due to the absence of hysteretic distortion following upon the elimination of all direct plate current from the transformer windings, a marked richness and brilliance of each individual note in a musical program is achieved. The curves show effective transformation ratios of over 4:1 for the first stage transformer, and of over 3.5:1 for the second stage type. These high ratios account for an increase in amplification on the order of, 16 to 9 for a two-stage amplifier using these transformers as compared against another amplifier using standard 3:1 transformers. This voltage gain which is nearly doubled, is responsible for considerably louder signals when the new transformers

are used. Their frequency characteristic leaves little to be desired for the bass amplification holds up well right down to 50 cycles, and in two stage operation continues on flat after the rise at about 100 cycles, right up to 6,000 to 7,000 cycles.

As these new transformers give very good bass reproduction, and as the tendency of an audio amplifier to motorboat increases with improvements in bass reproduction, a special B power unit (Lincoln 110B) has been developed of excellent regulation characteristics, and with low terminal impedance.* This B unit is especially designed for use with high quality amplifiers, since it has very good filtration, a variety of output voltages and low terminal reactance. It is equipped with taps for 22 volts, 90 volts, 135 volts and 180 volts. It also has an adjustment which allows one variable voltage ranging from 22 to 100 volts or more to be had, depending upon the load being drawn.

Coil Data

The oscillator coupler used in the Lincoln 8-80 is of the conventional type, the grid and pick-up windings of double silk covered wire and the pick-up coil of enameled wire. It has an extremely compact magnetic field and is especially designed to use in conjunction with the Lincoln No. 101 intermediate transformers and No. 103 antenna coil.

The antenna coil consists of a threaded bakelite tube, 2 3/4 inches in diameter by 5 inches long, space wound with No. 16-enameled wire. The winding is tapped in two places for variation of coupling. The r.f. resistance is 50 per cent less than any other coil now in general use, which augments the selectivity.

Assembly and Wiring

The general design of the Lincoln 8-80 is straight line, simplifying the wiring to a minimum. Four intermediates and two

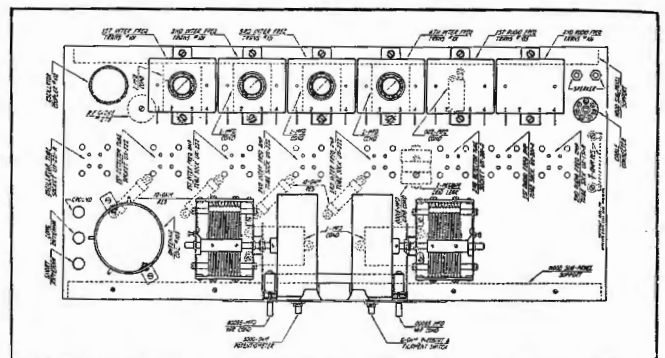


Fig. 3. Inasmuch as the panel which accompanies the kit is already stamped and sockets assembled, the builder should have no difficulty in laying out all parts of the super in accordance with the layout diagram shown above

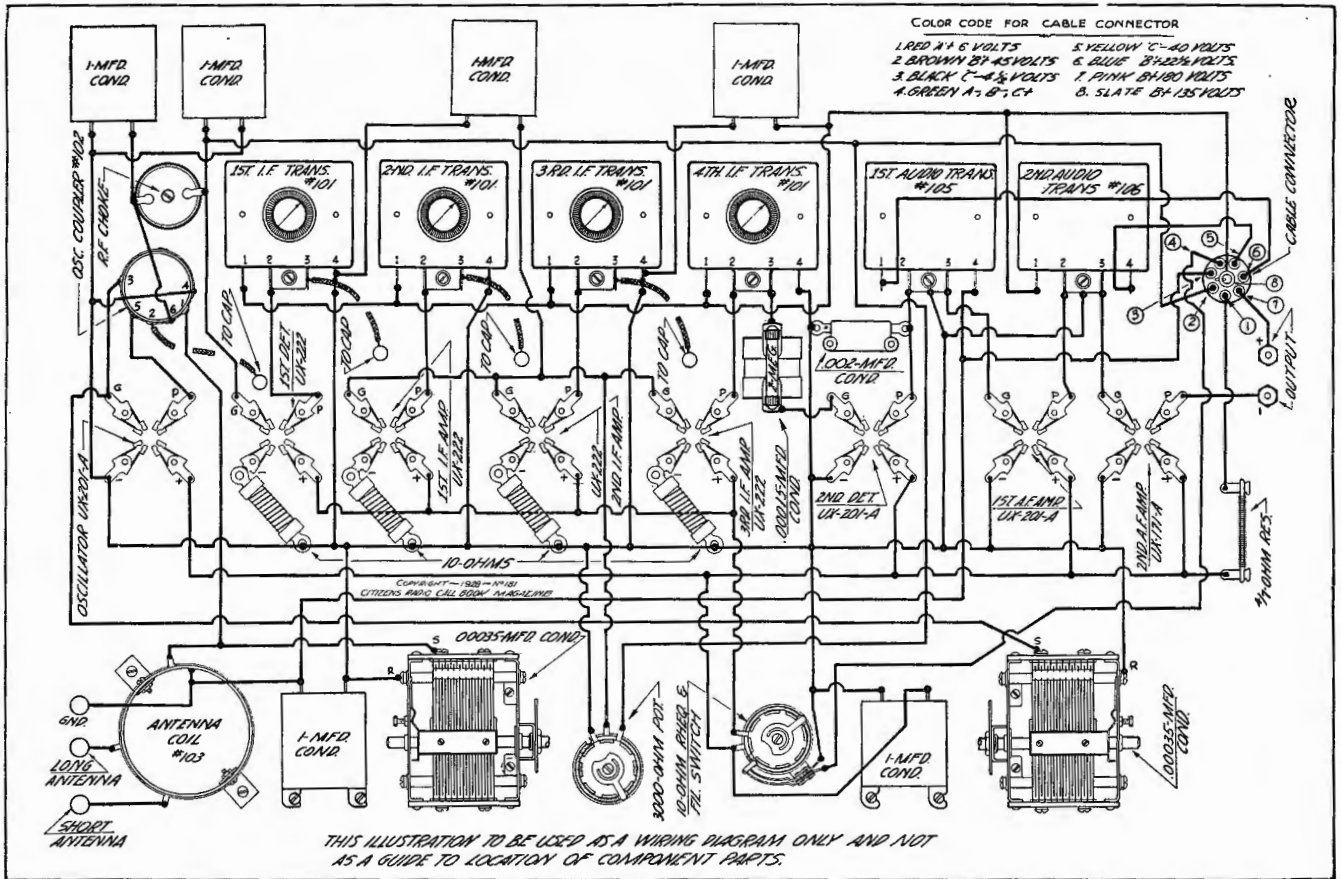


Fig. 4. This drawing represents the graphic wiring diagram governing the Lincoln Super described in this article. Do not use this illustration as a guide to the location of the component parts, but merely as a wiring guide. With the exception of the screen grid cap leads, one antenna lead and the two oscillator leads, all of the wiring is carried below the sub-panel

audio transformers in uniform heavy copper shells are placed in a row, sockets of substantial phosphor bronze with double contact springs are placed in a straight line immediately in front of transformers. Attractive escutcheon central control panel and variable condenser assembly is so arranged to fit either metal shielding cabinet or cutout panel for console. Shielding of screen-grid tubes was found to be unnecessary, which simplified construction to a great extent. The bakelite sub-base is completely drilled and all component parts can be mounted in a very short time. All wiring is done on the under side of sub-base and owing to the straight line layout can be done in straight busbar wiring.

Testing and Matching

After final checking of wiring connect Jones cable to any good B supply having taps for 22 volt, 45 volt variable, 135 volt and 180 volt. Use small dry blocks for 4 1/2 volt and 45 volt for biasing and any good 6 volt A eliminator or storage battery for filament. Place tubes in position and connect short antenna 10 feet to 15 feet) and ground.

Turn left hand potentiometer control half way on and right hand rheostat full to right. Set all knobs on i.f. transformers at point marked seven. Tune in a station reducing volume by potentiometer until signal is just audible, then adjust i.f. stages until signal is loudest. Now tune in distant station and readjust i.f. stages again. The receiver is now matched and need not be adjusted again until new tubes are used in intermediate stages.

Little need to be said as to operation of the Lincoln 8-80. Every receiver built will operate identically alike without oscillation or squeals. Stations of great distance can be brought up to full volume by potentiometer control only. Under some conditions a light socket aerial such as that made by Tobe may be used in the absence of a regular antenna.

Official Parts List

Parts required for the construction of the Lincoln 8-80 Super are shown in the list below:

- 1 Lincoln 102 oscillator coupler
- 1 Lincoln 103 antenna coupler
- 4 Lincoln 101 tuned i.f. transformers
- 1 Lincoln 105 first a.f. transformer
- 1 Lincoln 106 second a.f. transformer
- 2 Lincoln 104L and 104R .00035 condensers
- 1 Lincoln escutcheon control panel
- 1 Sub-base 2 1/8 x 9 7/8 x 3/8 inch complete with tube socket assemblies
- 2 Wood base supports 2 1/8 x 1 3/8 x 3/8 inch
- 1 Eight lead battery plug and cable
- 1 Silver-Marshall 806L (left) drum dial
- 1 Silver-Marshall 806-R (right) drum dial
- 6 Potter 4,1 mfd. condensers
- 1 Aerovox .002 mfd. condenser
- 1 Aerovox .00015 mfd. condenser with clips
- 1 Aerovox 2 megohm grid leak
- 1 Yaxley 53000-3000 ohm potentiometer
- 1 Yaxley 10 ohm midjet rheostat
- 2 Yaxley 420 tip jacks
- 3 Binding posts
- 1 Carter H-4/7 .57 ohm resistor
- 4 Carter RU10 10 ohm resistors
- 1 Silver-Marshall 275 r.f. choke
- 1 Yaxley 500 switch attachment
- 1 Small parts assortment
- 1 Package Corwico Braidite hookup wire
- 1 Package Kester radio solder

Shield Grid Model 32 Is Aristocrat of Aero's New 1929 Line

Matched Inductances, Chronophase Circuit, and Single Control Tuning in New Receiver

H EADING the list of the receivers marketed this season by Aero, the model 32 screened grid receiver is considered the aristocrat of the line, embodying three stages of tuned radio frequency and a tuned detector input on utilizing the Chronophase system, insuring selectivity and sensitivity sufficient to cut through locals and receive distant signals with unprecedented clarity and volume.

There are many factors which go to make up the excellence of the 7-29 receivers, of which the model 32 is the foremost, inasmuch as it employs the screened grid tubes so well liked by the radio public at this time. One of the features of the receiver is the use of the new Aero transformers which contribute a beauty of reproduction that will be a revelation to the set builder who is accustomed to ordinary transformers. A comparison between these transformers and the old style is quite enlightening. Due to their new type of construction involved in these audio units, a beautifully even amplification characteristic varying less than 2% in amplitude over the wide range of audio frequencies has been secured, with a sharp cut-off to the upper end of the frequency band so that all of the usual popping and scratching noises ordinarily heard as a result of atmospheric and tube noises are lost and only the full tones of the signal reach the loud speaker.

Single Tuning Control

In order that single control may be absolutely practical, the Aero coil kit used in the 7-29 receiver consists of four coils which are not only wound as nearly alike as possible but are thereafter matched at both the high and low ends of the broadcast band. Each of these coils is put in a receiver with a carefully calibrated dial and a signal from an oscillator is impressed on the receiver, first at 200 meters and then at 550. The operator in the factory then inserts into each coil a slip of paper with the calibration of the coil at each of these wave lengths. After a number of coils have been calibrated, they are sorted into matched sets of four, each of which is exactly alike. When inserted in the receiver these coils will give proper operation over the whole band from the bottom to the top of the broadcast spectrum.

Uses Sturdy Condenser

To gain full advantage of the careful matching of Aero induction units, it is necessary that the variable condenser used in the receiver be solidly built and of such sturdy construction that it will retain its calibration indefinitely. In addition to that, there must be provided a means of compensation for any variation in capacity which may occur while the set is being wired. After

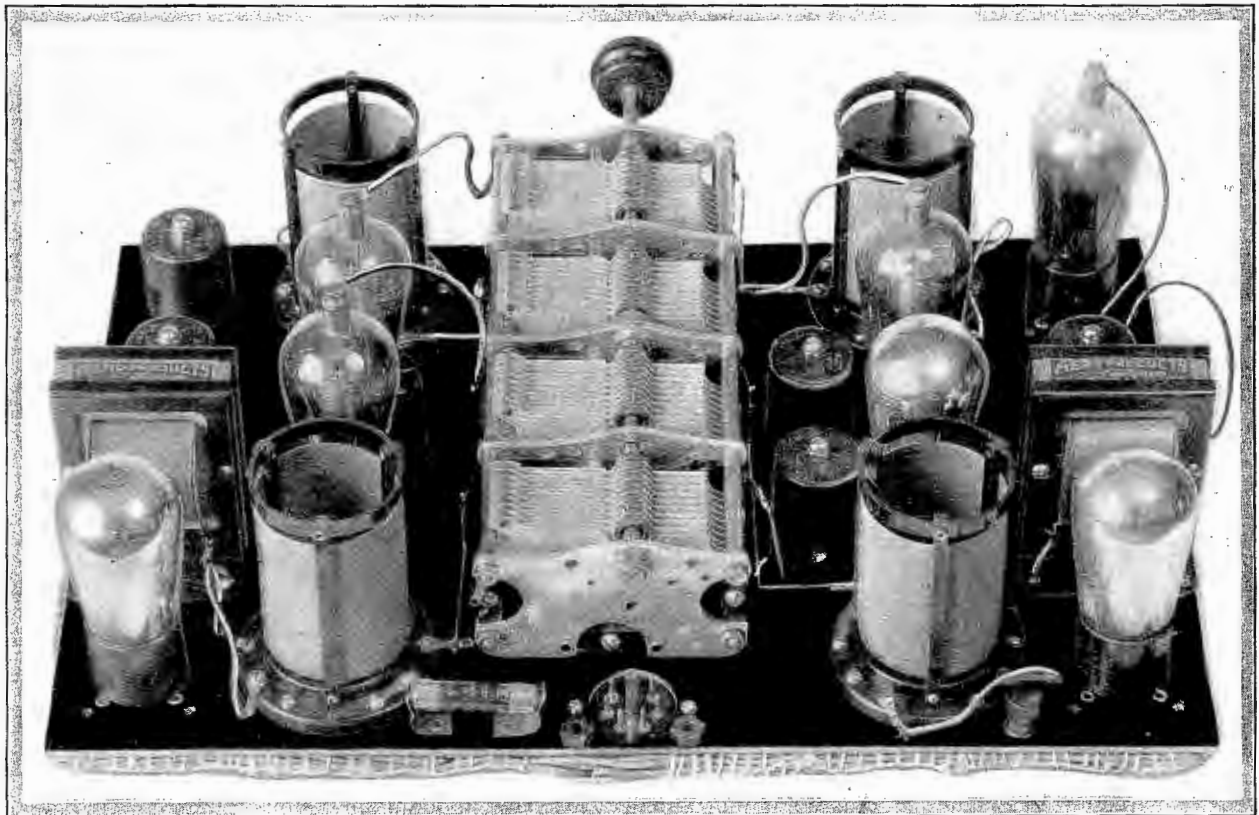


Fig. 1. This photograph shows the rear view of Aero's screen grid receiver described in the accompanying article. The foundation kit of this receiver is the same as that used for the a. c. model or for the d. c. model with 201-A tubes. Thus one foundation unit serves for three or four models of a receiver, only slight changes being required to change from one type to another

(This receiver tested and all illustrations made in our laboratory)

careful tests of almost every variety of condenser on the market, two types have finally been selected. These are of almost identical dimensions and will operate interchangeably in the 7-29 receiver. Both have unusually heavy plates, wide spacing between the plates, and sturdy frame works. Both types are provided with small screw adjustment compensators on each section by means of which the section may be lined up exactly in resonance with its neighbor.

Semi-aperiodic Antenna

An inspection of the schematic circuit shown in Fig. 4 will disclose that a semi-aperiodic input stage is employed in order that no difference in antennas may cause any change in the operation of the receiver. For stations within five hundred miles no attention need be paid to the midget condenser, but when it is desired to receive signals from very distant stations it will be found that an adjustment of this control will greatly increase the range of the receiver. This midget is placed across the semi-aperiodic coil AA-18. Proper co-ordination of all these parts in a single circuit with extreme care paid to arrangement and wiring will assure the builder of a remarkable receiver. The use of the Chronophase system makes possible the utilization of any of the present type of tubes, regardless of their characteristics, and since there is so great a spread between the characteristics, for example the 112 type tube and the screened grid tube, it is very probable that the receiver using the Chronophase principle of radio frequency amplification will be adaptable to any of the new tubes which may come out during the coming year.

The principle of controlled phase displacement, combined with

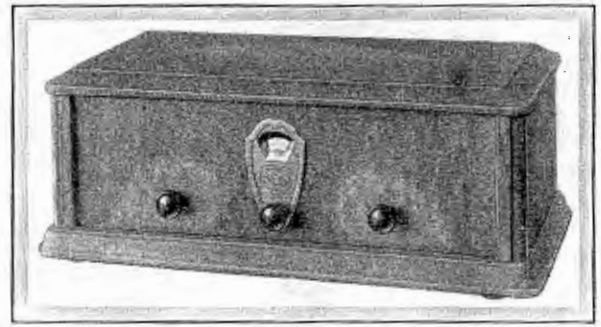


Fig. 3. The entire Aero line is being marketed this year in metal cabinets similar to the one shown above

the ability to match the circuit impedance to the plate impedance of the tube over tremendously wide variations, is unique in the Chronophase circuit, the details of which may be seen in the schematic. Instead of the conventional primary and secondary radio frequency transformer, under the Chronophase system there is only one actual inductance, this being the secondary. The input to the secondary is through an .001 mfd. condenser from the junction of the plate and the top of the radio frequency choke coil. An inspection of this particular circuit will show that the selectivity as compared to amplification obtained in this system is far superior to that which will be obtained from coils of the standard type hooked up in the standard way. The circuit can be adjusted

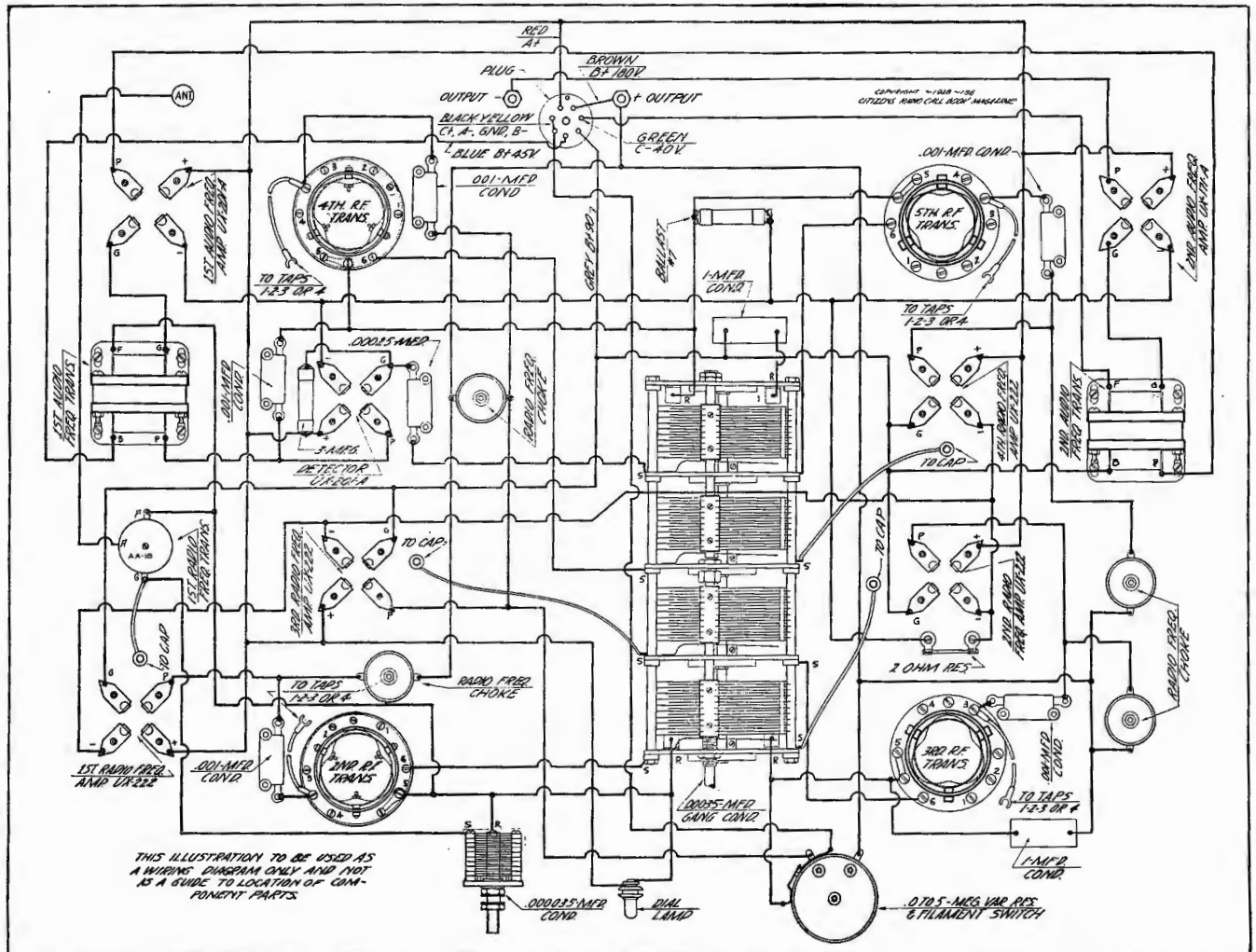


Fig. 2. In this illustration is shown the method by means of which all wiring may be accomplished on the receiver. It should be particularly noted that the illustration is not to be used as a guide for the location of parts but only as a means of wiring the receiver

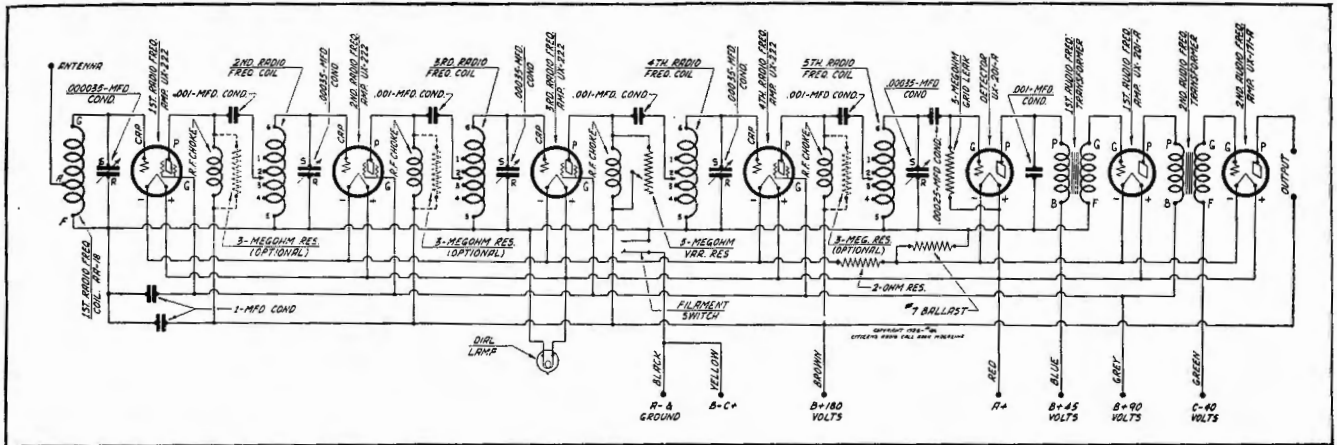


Fig. 4. The electrical characteristics of the circuit used in the receiver described herein may be found by consulting the above schematic circuit

in such a way that side-bands will be cut off or, if the user desires, it can be so adjusted that two or three stations may be heard at one time. While no one will go to either of these extremes, nevertheless it is pleasant to feel that reserved selectivity is available at all times.

No Motorboating

A further advantage of the Chronophase system may be seen in the fact that regardless of the position of the oscillation and volume control, there is no change in the voltage applied to the plate of any of the tubes, and consequently the 7-29 receivers may be used on a good B eliminator without any danger whatever of trouble from "motorboating" and similar phenomena.

The assembly of the Aero 7-29 is extremely simple when the tremendously high gain of the receiver is taken into consideration. First the four-gang condenser should be mounted in the center of the panel. It will be found that it just nicely fits in between the hole for the Yaxley cabinet plug and the front of the panel. The Yaxley plug, itself, should be mounted on the under side of the panel with the prongs projecting up through and the red and black tip-jacks binding the plug to the panel. The coils of the receiver are interchangeable, so there is no danger of getting them in the wrong position. However, they must be carefully oriented with regard to the position of the numbered terminals. The antenna stub is mounted to the extreme left of the set, and its position may be readily distinguished by the fact that additional holes are punched in the base of the panel to carry the leads.

All of the filament, B plus and grid return leads should be carefully cabled into a single cable extending around the outside of the set. In the case of the a. c. set, separate twisted pairs of leads which can be included on the cable should be run to each pair of 227 tubes. Each pair of these tubes will draw 3 1/2 amperes of current, which is well within the current carrying capacity of the ordinary wire, while to operate the whole six on a single twisted pair would cause heating.

Use Care in Wiring

After carefully cabling all of the low frequency leads, wire in the grid leads on top of the subpanel and the plate leads below the subpanel. Great care should be taken to keep any of the plate leads from proximity to any of the grid leads and to keep the plate and grid leads of succeeding tubes from being too close to each other. Great care should be observed at this point, as any careless wiring here will probably result in a feedback which will cause the set to oscillate violently over the band.

In the screened grid model 32 filament control is by means of a No. 7 ballast and a 20 ohm resistance, part of the resistance giving a voltage drop for the bias on the grids of the 222 tubes.

The screened grid circuits are all energized from the B 90 terminal, properly bypassed with a 1 mfd fixed condenser. The plate circuit of each 222 tube is supplied from B 180 through the respective r. f. choke for each tube. In the first stage and the second stage a 3 megohm fixed resistance is shown dotted in on the diagram, this being optional. The only variable control is the 5 megohm located across the r. f. choke in the third radio frequency amplifier plate. The grid of the first audio stage secures its bias through the drop across the filament resistor, while for the grid of the 171 A power tube the bias of C minus 40 is provided. A filament switch is located in the negative A and current line.

Testing and Adjustment

After the set has been properly wired, it is ready for testing and adjustment. Attach the flexible taps of the plate leads to terminal tube of each coil. Put the midget condenser half in and half out. Tune in a station, or the squeal of a station. If the set cannot be thrown out of oscillation, vary the flexible lead on the taps until oscillation may be controlled. Then tune in a fairly weak signal. Turn up the stabilizer until the set just oscillates. Then with the set in oscillation adjust the stabilizer units on the various sections of the multiple condensers until maximum volume is secured. Retuning to a weaker station is necessary so that while the adjustments are being made the volume is always kept at a fairly low value. With the Aero 7-29 in proper adjustment good loud speaker volume should be obtained in the center of the country at almost any time. When perfectly balanced the radio frequency amplifier should go into oscillation with the stabilizer about one-third of the distance from minimum resistance, and it should go in and out of oscillation at the same point. If the set does not oscillate easily enough, raise the tap on the detector input coil. If it oscillates too easily, reduce this to tap No. 1. If sufficient selectivity is not obtainable even with the antenna coil at tap No. 1, reduce the tap portion of the middle coil. Touching the first section of the tuning condenser should completely stop operation. Touching the second section should also stop operation, and touching the third stage should reduce the volume considerably.

If the set is lacking in volume, or if a continuous high pitch whistle or growling noise is heard, a 2 mfd bypass condenser should be connected across the B minus and B plus 180 volt taps. Such a noise as this is caused by common coupling through the resistance of the batteries or eliminator, between the plates of the radio frequency tubes and the plate of the detector tube, and the bypass condenser just mentioned serves to reduce the resistance of the battery to alternating currents to a point where low frequency oscillation or "motorboating" will not take place.

The need for careful adjustment of both taps and synchronizing stubs on the multiple condenser cannot be too strongly emphasized. If either adjustment is not correct, there will be a pro-

(Continued on page 144)

Silver-Marshall Line Now Includes Public Address Systems

Growing Demand for Power Amplifiers for Outdoor Entertainment; Some Models Described

ANSWERING a long felt demand for public address systems comparable in operation and efficiency to those of the communication service companies but not costing the tremendous price usually asked for such systems, Silver-Marshall of Chicago have recently designed a line of power amplifiers in so varied a form that any desired type of system for any class of service may be easily assembled from the unit plans which form their basis.

For Every Need

With these new S-M public address type panels, fully light socket operated amplifiers can be had to serve the smallest theatre or the largest auditorium. Their use is applicable to large hotels, apartment houses or hospitals, all with equal facility and at a price within the reach of the average professional set builder who is doing public address work.

On this page is shown a composite photograph of the front, rear exposed, and rear enclosed views of a popular type of public address system, made up from the S-M unit panel assemblies, mounted on a standard steel rack. This amplifier is typical of types previously sold for many thousands of dollars, and the extent of the service it will render is quite broad. Its undistorted power output is about 30 watts and the overall amplification is sufficient to give adequate volume. With suitable loud speakers, it will give voice, phonograph, music or radio coverage of a 6,000-seat audience. It will also give coverage of a baseball park or stadium seating 10,000 to 20,000 people.

A description of the different units making up this system will indicate their flexibility. The system illustrated consists of a steel rack carrying from top to bottom a visual volume indicator panel, an input control (selector panel), input amplifier panel, a test meter panel, an input amplifier power supply panel, two push-pull output amplifier panels and two blank panels for loud speaker control or other apparatus. All operating power is drawn from any 105 to 120 volt, 50 to 60 cycle alternating current lighting circuit, with

the exception of the eight dry cells used for microphone operation. Through the use of a rotary converter, the system may be operated from any available power lines.

The Type PA-1A amplifier rack, or framework, is standard for mounting of all systems. Side beams are heavy steel channels connected at the top by two steel straps and at the bottom by steel angle feet extending sufficiently to support the complete assembly. For permanent installation the feet should be bolted to

the floor through holes provided. The rack assembly is effected by nuts and bolts and can be easily and quickly assembled. The racks are equipped with an "on-off" switch in the upper cross bar, which, connected to all power panels, controls the whole system. All panel sizes and piercings are co-ordinated with rack size and piercing in such a manner that any S-M public address panels may be inserted in any position in the rack, thus allowing replacement or interchanging to meet new conditions with little mechanical work.

Standard Panels

Standard aluminum panels are of two sizes: 8 x 21 x 1/4 inches and 4 x 21 x 1/4 inches. The large panels are equipped with dust covers of heavy gauge aluminum, which provide effective electrical shielding for the units as well. These covers slip over four-

corner guide rods, to which they are fastened by screws. The dust covers are slotted at both ends to permit panel connecting cables to enter the terminal blocks. All terminal blocks are designed in such a manner that connections between panels can be made and checked with ease from circuit diagrams affixed to the inside of each cover.

In the amplifier illustrated, the top panel is the PA-60A volume indicator, completely a. c. operated, deriving filament and plate current for its 227 tube from the PA-40A power supply panel, which is the fifth down from the top. The volume indicator has at the left an input control graduated in 15 steps of 2 transmission units each and gives control of the voltage admitted for measure-

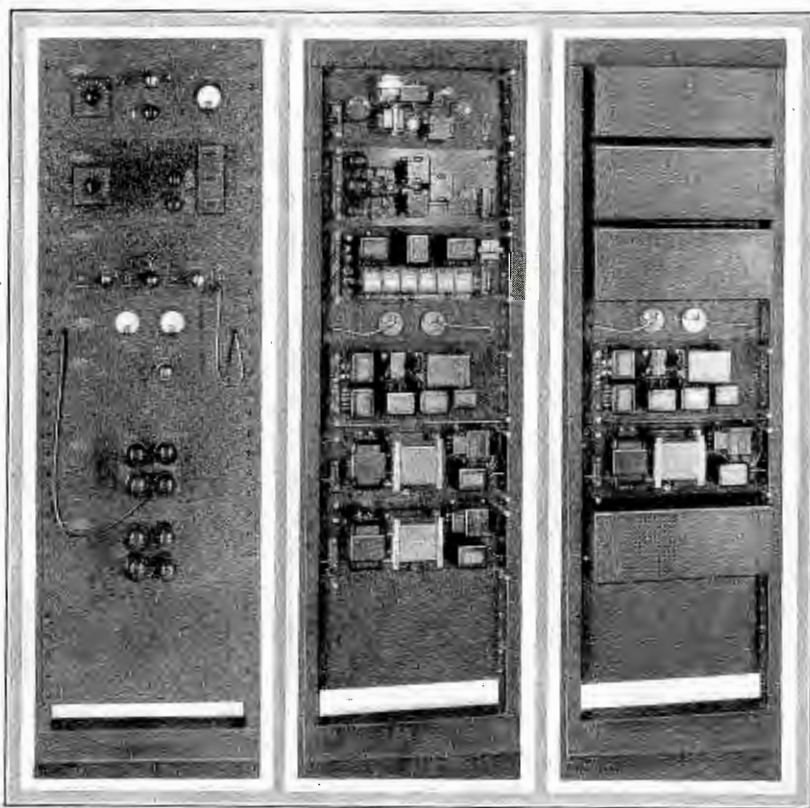


Fig. 1. This photograph shows three views of the rack and panel type of public address units. The left section is the front view, the center the rear view without covers, and the right the rear enclosed in dust covers

ment. This voltage is measured across the output of the PA-20A input amplifier, third from the top, which is also the input to the PA-30A output amplifier panels, the latter two being sixth and seventh from the top.

Signal volume level is indicated by the milliammeter at the right of the panel. The circuit is a special adaptation of the vacuum tube voltmeter circuit, the calibration of the tube circuit being effected by means of the bias adjustment knob. The calibration for normal signal level is drawn onto the meter scale with special level marks, two transmission units above and below the normal value. These meter readings give definite indication as to how much the level should be raised or lowered in operation to maintain the normal volume at a distant point. The PA-60A volume indicator is of special service where the operator and amplifier are located in such position that he is unable to hear the actual reproduction. Such a case may occur where equipment is located under the stage in an auditorium or at a race track. In such a case the operator would adjust the input to the PA-20A input amplifier until an observer in the audience signals that volume is correct. Then the operator would turn up the volume control on the PA-60A panel until the meter showed normal volume and on subsequent numbers on the program he should adjust volume control on the input panel in such a manner that the volume indicator meter should show that normal signal level was being maintained. The PA-60A panel is not always necessary, as a special monitoring circuit is provided in the output of the PA-20A input amplifier, to which a loud speaker may be connected for observation of signal level and quality.

Next below the volume indicator is the PA-50A input control panel, including a control graduated in 15 units of two T. U.'s to regulate the input to the amplifier from the various services, which in this panel are phonograph, radio and a choice of either one of two microphone circuits. Three telephone keys grouped on a sub-panel at the right control these services.

Hum Balancers

Third down from the top is the PA-20A input amplifier, cross connected to the PA-50A panel immediately above. This is the three stage alternating current operated voltage amplifier, using one each of the 227, 226 and 171 tubes. The interstage coupling transformers are of the Clough tuned type, manufactured by S-M, providing an excellent frequency characteristic and eliminating hysteretic distortion. The output circuit is of special design, so that up to eight power stages of type PA-30A output amplifier panels may be operated in parallel from it without diminution of volume or appreciable change in frequency characteristic. Hum from the supply line can be balanced to a negligible value by means of the hum balancers on the panel. The first two tubes of the amplifier are supported on special sponge rubber mountings to prevent noises from building vibrations, etc.

The condition of the input amplifier tubes may be checked by means of the PA-10A meter panel, and plainly marked jacks in each tube circuit. This PA-10A meter panel, the fourth down from the top, is a 4-inch panel without dust cover, carrying two milliammeters with flexible cords and plugs for checking microphone and tube currents and keeping the entire system in proper operating condition.

The PA-20A input amplifier ordinarily operates from the PA-40A power supply panel, which is the fifth down from the top. This carries the necessary transformers for filament and plate supply, operating in conjunction with a 280 rectifier, as well as the large filter and the necessary isolation circuits for the operation of the high amplification system. No operating adjustments are necessary.

The PA-30A output amplifier is completely self-contained, with its own power supply, consisting of a transformer for plate and filament voltages, two 281 rectifier tubes and the necessary filter condensers. An input transformer is included, which permits the operation of seven to eight PA-30A output amplifiers from one PA-20A input amplifier. The PA-30A output amplifier employs two 250 tubes operated at full rated plate voltage of 450 volts in a single stage power amplifier circuit. Under these conditions, the tube in itself has an undistorted output of 4.65 watts or a

total of 9.3 for the pair. Due to the push-pull circuit arrangement, normal grid excursions can be exceeded by increasing the undistorted output to a maximum of 15 watts. Increased output capacity may be effected by expansion up to eight PA-30A panels for a large apartment, hospital or school building, thus providing service for every room. The PA-30A output amplifiers can be provided with output transformers to customer's order, either for operation with a group of magnetic speakers or a group of dynamic type reproducers for indoor or outdoor service.

General Coverage

It is difficult to predict, except in a general way, the possible coverage which may be obtained from a single PA-30A panel with different types of reproducers. In practice, however, it may be assumed that a PA-20A input amplifier operating one PA-30A output amplifier will operate up to 30 speakers for school-room or hospital installation, will give adequate coverage of any theatre seating up to 5,000 people, or an average baseball park seating 10,000 to 20,000 people, or one to three average school assembly rooms or auditoriums. The addition of a second PA-30A panel will approximately double this coverage.

Can Get Data

Professional set builders and others who are desirous of going into public address work may secure from the engineering department of S-M computations showing the approximate cost of any installation selected by the professional set builder or operator. Information as to the size and shape of the rooms or halls, with as much data as possible as to the texture of the wall coverings, doors and openings, hangings in the room, etc., will be of great service.

If the control room should be far from the point of reproduction, it is well to show the relative location of the two and the distances involved. For outdoor work the locations of the stands, track or field are useful in making recommendations, as well as data on the noise prevalent in the surroundings. Photographs are of value in making estimates on both outdoor and indoor installations.

Under some circumstances it is advisable to split the output of a single PA-30A panel for two separate services. For example: in a hotel it might be desired to operate a speaker in the lobby and to use it, regardless of the average output, for room service. Due to the larger volume required in the lobby over that of the rooms, it would not be feasible to operate all speakers in parallel and at the same volume level. For such service the PA-70A output control panels should be used. Due to the variations in the requirements of individual installations, S-M does not stock these panels, but they are built to order only. Practically any conceivable combination can be made and circuits can be supplied in them for operation into any group of speakers or into telephone lines.

As an example to the professional set builder or others interested in public address work, a typical problem may be stated as follows:

An Example

Assume an amplifier system for a theatre having up to 6,000 seats is required for voice, radio or phonograph record coverage, with first consideration given to phonograph record reproduction as musical accompaniment to moving pictures. Coverage of such a theatre can be effected through the use of four dynamic reproducers grouped about the stage and operated from a single PA-30A output amplifier. The required installation would, therefore, consist of one PA-1A amplifier rack, one PA-50A input control panel, one PA-20A input amplifier panel, one PA-10A meter panel, one PA-40A power supply panel and one PA-30A output amplifier panel. The above panels mounted in the PA-1A amplifier rack will provide a complete a. c. operated amplifier system with test meter to check operation, allowing selection of one or two microphone or telephone lines, or radio or phonograph input. It will operate four dynamic speakers to provide full coverage of a 5,000- to 6,000-seat house and will require, in addition to tubes, a radio receiver furnished with a

(Continued on page 140)

Scott World's Record Screen Grid 9-B Is Battery Operated

Both Audio Stages Included in This Model; Novel Condenser Plug-in Allows S. W. Reception

SINCE publication in the September issue of this magazine of an article covering the construction and operation of the Scott Screen Grid Nine, there have been many inquiries from interested professional set builders and fans as to whether a model would be available shortly in which both stages of audio frequency amplification are included and which might be operated from dry B batteries.

In answer to this demand, the Scott interests have just completed a design known as their World's Record Screen Grid 9-B, which employs two stages of audio in the receiver proper, these two transformers being contained within a single case and known as the Selectone audio transformer 645. With this audio arrangement, the power tube used in the receiver is a 171-A, which gives ample volume for room entertainment purposes and at the same time is quite economical on plate current. Another of the features involved in the model 9-B is the provision whereby a plug-in fixed condenser may be used to decrease the overall capacity of the oscillator condenser so that an operator may tune with facility across the short wave band. Two oscillator coils and two antenna coils are provided for covering this band, their ranges being from 20 meters to 50 meters and from 35 meters to 90 meters, the former known as type No. 612 and 611, the latter as type 632 and 631. The ninth tube socket is included in this model of the receiver and is shown in the baseboard layout illustrated in Fig. 5.

These are practically the only departures from the standard Scott Shield Grid Nine, and as previously stated these changes

in design were in direct response to requests from fans and set builders for a receiver suitable for room volume that did not involve the employment of a special power amplifier, because in many locations of the country alternating current is not available and the power amplifier layout would have been useless.

What Circuit Contains

Analyzing the schematic circuit shown in Fig. 4, it will be seen that when the receiver is being operated on the standard broadcast wavelengths, energy enters the set via the antenna coil and is induced into the secondary of the first radio frequency transformer, where it is tuned by the first section of a .0005 mfd variable condenser. From the plate circuit of the first 201-A it passes into the secondary of the second radio frequency transformer, which is the grid circuit of the first detector. Here tuning is accomplished by a .0004 mfd variable condenser having a trimmer across it with a value of .000135, the purpose of which is to balance the .0004 against the .0005 in the preceding stage. Mixing is accomplished through the pick-up winding located in the grid circuit of the first detector, this coil being in inductive relation to the grid and plate windings of the oscillator coupler 610. The windings for the oscillator coil are of a fixed nature and the pick-up contains just sufficient wire to allow good mixing and selectivity in that particular position of the circuit. Detection in the first detector is by means of the .00025 mfd grid condenser spanned by a 3 megohm grid leak. This first detector is located inside the screen grid amplifier unit No. 600, this

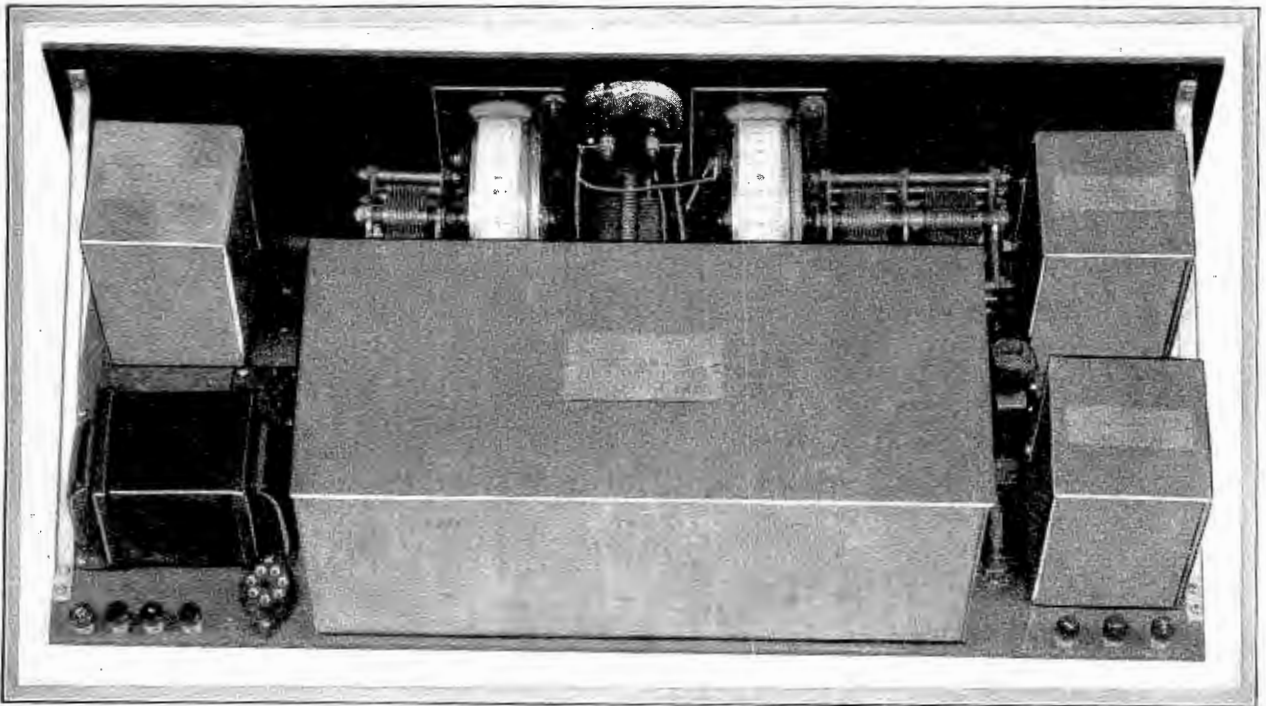


Fig. 1. The rear view of the Scott 9-B described in this article is shown in the above photograph. The case containing the two stage audio is shown at the left rear in the photograph. The balance of the receiver is practically the same as the one described in the September issue of this magazine

(This receiver tested and all illustrations made in our laboratory)

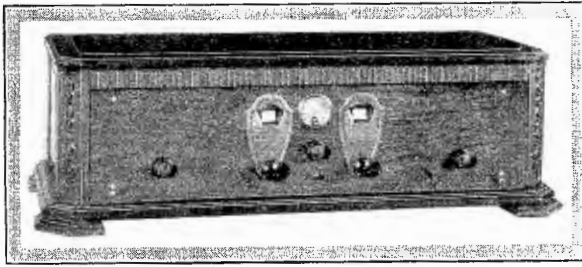


Fig. 2. This photograph shows the completed receiver mounted in a cabinet. There is no departure on the front panel from the standard shield grid nine

units being shown in the schematic within the dotted lines of the diagram. The second radio frequency transformer, type 620, has a regenerative winding and by means of the .000055 mfd midget condenser it is possible to make the first detector semi-regenerative. The plate circuit of the first detector is provided with a radio frequency choke so as to prevent the passage of r. f. into the shield grid amplifier.

I. F. Unit Unchanged

No changes have been made in the electric circuit of the No. 600 amplifier. Here there are employed three screen grid tubes, each with a resistor in the negative filament to provide a sufficient drop in voltage for the proper bias of the grid of the 222 tube. A 15 ohm rheostat is employed with a limiting fixed resistance so that the operator at no time can exceed 3.3 volts on the filaments of the 222 tubes. This is quite essential because of the fact that many individuals have a propensity for running their tubes at higher than their rated voltage and in the case of the screen grid tubes, this almost immediately results in de-thorization of the filament with its consequent lack of amplification.

The screen grids of the three 222 tubes are connected together and are supplied from a potential of 45 volts, this value of voltage being approximately the best for these tubes, although there have been certain conditions under which a screen grid potential of 67½ volts will give better results. The plate circuit of the oscillator is also energized from the 45 volt terminal that leads to the screen grids, and anyone using more than 45 volts on the screen grid should remember that this automatically gives the operator a higher plate potential, which may not be quite so desirable, especially in the case of local reception. However, the operator should try both 45 and 67 volts on the screen grids and determine for himself the best operating voltage.

All of the screen grid and plate circuits in the amplifier are bypassed within their respective cans, so that there is no feed

back from one stage to another. As is customary, the plate voltage of the 222 tubes is placed at 135 volts, which is also the value supplied to the plate of the first audio amplifier, where a 112-A is employed. The maximum voltage of 180 is applied to the plate of the 171-A, where a C-40 grid bias is maintained by means of a dry C battery. The 7½ volt negative terminal of the C battery is used for biasing the grid of the 112-A in the first audio stage, while the C negative 4½ volt terminal of this same battery is utilized to furnish the necessary detection bias on the grid of the second detector, which is a 201-A tube. The secondaries of each of the four intermediate transformers are tuned with a fixed capacity within the shield and the four units are matched exactly at the factory before being included in the amplifier. By this means of matching, and a standard test on the air, it is possible to insure that the shield grid amplifier is properly balanced before it leaves the factory.

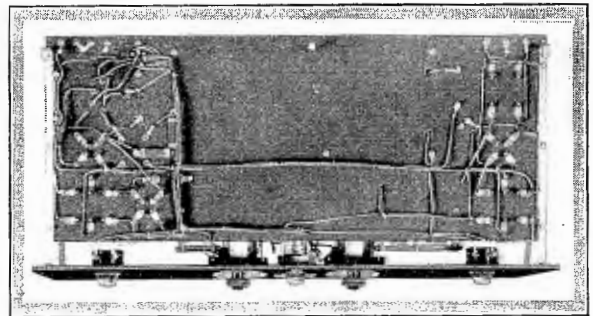


Fig. 3. Builders of these sets may readily see the small amount of wiring required for hooking up the receiver. The leads are cabled after the wiring has been put in

A 25 ohm rheostat in the negative filament of the first radio frequency tube acts as a volume and sensitivity control. The filament circuit of the second detector and the first audio is controlled by a 2 ohm fixed resistance. The oscillator tube has a 2 ohm resistance in series with the negative leg, so that its operation is at rated voltage. The first radio frequency stage and the second detector are worked at 90 volt plate potential.

Short Wave Operation

The foregoing refers to the operation of the receiver on standard broadcast signals. In the following remarks readers will see how the set works when used for picking up signals from short wave, phone, code and television transmission. Special oscillator coils are furnished for the short wave band and are plugged into the circuit. Also special short wave second radio frequency transformers are provided, which plug in place of

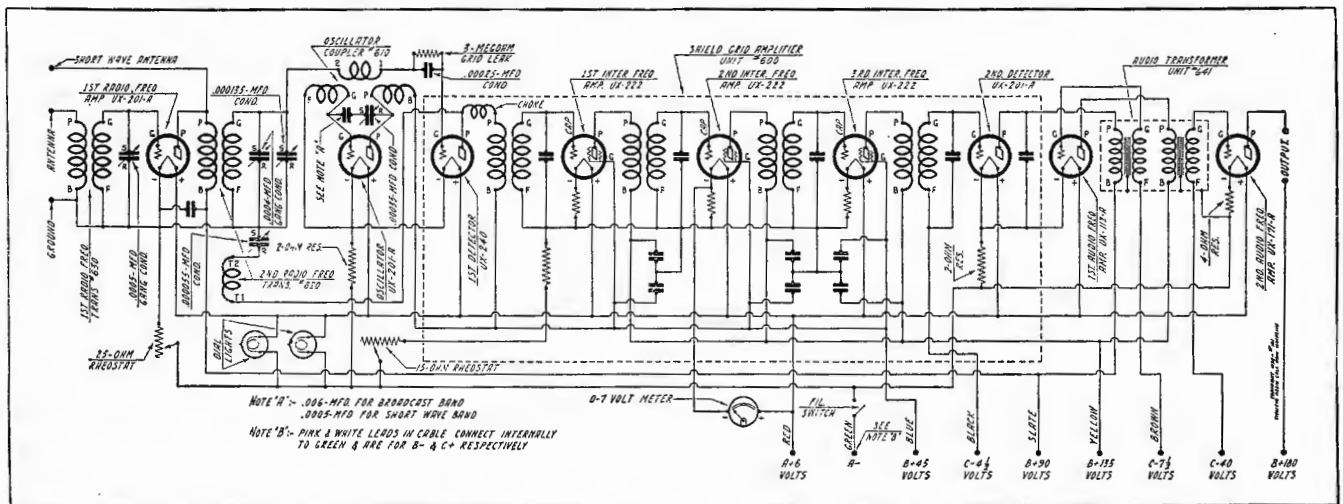


Fig. 4. The schematic of the 9-B is shown above. Special attention should be paid to the fixed condenser shown in series with the variable across the grid and plate of the oscillator, since this plug-in condenser is the one that enables the operator to shift from the high to low waves

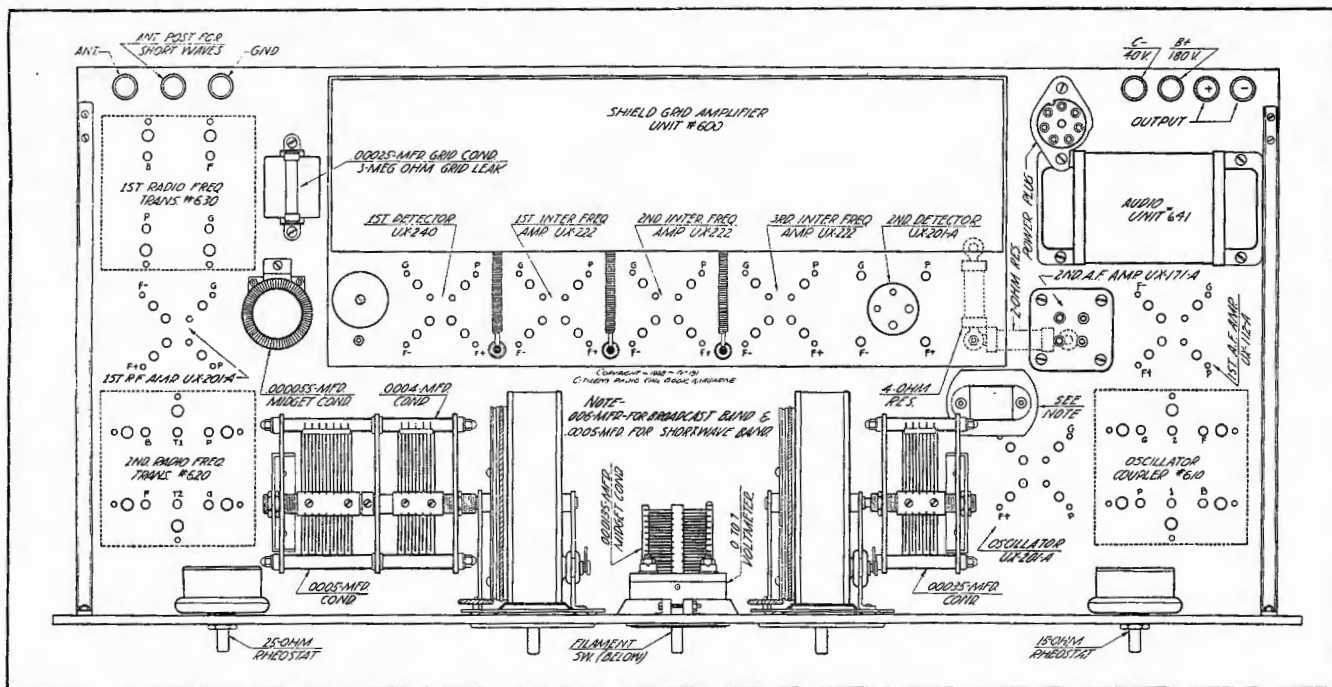


Fig. 5. This illustration shows the layout of all parts in the 9-B. At the right of the oscillator variable condenser may be seen the plug-in fixed condenser by means of which short or long wave stations may be received. The extra socket is shown at the right of the shield grid amplifier unit No. 600, while the double audio stage enclosed in a single housing is illustrated at the right rear

the 620. The 25 ohm rheostat is turned to the "off" position so that the first radio frequency amplifier is not operating and the antenna is removed from the normal antenna binding post and placed on the short wave antenna. Then a plug-in fixed condenser, made by Sangamo and equipped with two General Radio plugs, is put into the two jacks below and to the right of the oscillator condenser shown in the layout diagram, Fig. 5. This fixed capacity of .0008 when placed in series with the .00035 variable condenser reduces the overall capacity to a value suitable for tuning across the short wave oscillator coil without this tuning being too critical. Under these conditions the small fixed condenser serves to reduce the overall capacity of the oscillator tuning condenser, whereas when a .006 mfd condenser remains plugged in the circuit during operation on the broadcast band, the extreme capacity of the fixed prevents a change in the overall capacity from grid to plate of the oscillator circuit. If by mistake the .0008 is left in the circuit when tuning on the broadcast band, the oscillator condenser will not cover the range.

Code Reception

There is a difference in tuning this receiver to the broadcast waves and tuning it to the short waves, providing one desires code transmission. However, if one only desires broadcast signal or television transmission, the tuning is identical on short waves as well as long waves. However, if the receiver is to be used for code work at all, the 15 ohm rheostat governing the intermediates should be turned up as far as possible so as to throw the intermediates into oscillation and under these conditions the dots and dashes are audible. While this method of operation is not one that will be used by very many individuals, nevertheless, the method of control is given so that those who wish to hear code stations may do so. The average operator, however, will tune his receiver in exactly the same manner as if he were tuning on the regular broadcast band, with the possible exception that the oscillator tuning and the tuning of the second section of the gang condenser across the first detector will be more critical than on the higher wave lengths.

For those who wish to receive long distance broadcast during the day time, the short wave connection is an ideal one because by means of it WGY and other short wave stations may be picked up at high noon with considerable volume. It is also

possible by means of the short wave connection to listen for European broadcast stations now doing experimental transmission on the shorter waves.

Official Parts List

The parts required for the construction of this receiver are shown in the following list:

Receiver

- 1 Selectone 2 gang condenser, .0005-.0004 No. 650, and bracket
- 1 Front panel, drilled, 26x7
- 1 Sub-panel, drilled, complete with sockets, 25x10
- 1 Selectone variable condenser, .00035, No. 660, with bracket
- 1 Selectone variable condenser, .000055, and bracket
- 1 Selectone variable condenser, .000135, No. 671
- 2 Illuminated drum dials with bronze escutcheons
- 1 Selectone double audio unit, No. 654.
- 1 Selectone screen grid amplifier unit No. 600
- 4 Selectone tube shields No. 680
- 1 Selectone transformer No. 630 (Ant. 200-550)
- 1 Selectone transformer No. 620 (R. F. 200-550)
- 1 Selectone transformer No. 610 (Oscillator 200-550)
- 2 Pair brackets
- 1 Selectone rheostat, 15 ohms
- 1 Selectone rheostat, 25 ohms
- 1 Fixed resistor, 2 ohm
- 1 Fixed resistor, 4 ohm
- 1 Bronze filament switch
- 1 Fixed condenser, .00025, with grid clips
- 1 Durham grid leak, 3 megohm
- 1 Benjamin cushion socket
- 1 Special voltmeter
- 1 Special ten-wire connecting cable and plug
- 8 Binding posts

Short Wave Equipment

- 1 Selectone transformer 612 20-50) oscillator
- 1 Selectone transformer 611 (35-90) oscillator
- 1 Selectone transformer 632 (20-50) antenna coupler
- 1 Selectone transformer 631 (35-90) antenna coupler
- 1 Sangamo .006 mfd with plugs
- 1 Sangamo .0008 mfd with plugs

Citizens Super Eight Using H. F. L.'s New Intermediate Amplifier

Efficient and Desirable Receiver May Be Easily Assembled Using
Isotonic Wired I. F. Unit

PROFESSIONAL set builders and experimenters have long been seeking an intermediate frequency amplifier which might be used in a number of superheterodyne circuits, the input and output circuits being built around the intermediate amplifier in accordance with the wishes of the experimenter. This method of construction has been desired by many because quite frequently the fan will have on hand tuning capacities and audio transformers that could be used to advantage in such a hook-up providing a simple, compact intermediate amplifier were available.

Separate Amplifier

At the beginning of this season when H. F. L. announced its Isotone screened grid super model arrangements were also made for the merchandising of the screened grid amplifier in ready wired form so that those who wished to make use of the amplifier in a circuit design of their own might do so economically and in accordance with their own ideas as to set construction.

The receiver described in these columns has been built up somewhat on the foregoing lines and is presented to our readers as an example of one of the various forms of supers which can be readily assembled around a standard screened grid amplifier.

The photograph shown in Fig. 1 gives an idea of the layout in general. That part of the amplifier shown at the right of the sub-panel in the photograph is the Isotonic screened grid amplifier, the photograph being taken while the shields were removed. Each of the four stages shown on the small chassis are wired at the factory, and the inductances peaked at a definite value. However, by means of the small trimmers located at the top of the

inductances the operator may shift this frequency within limits to suit his own purposes. The Isotonic amplifier is laid out on a substantial metal chassis, and the shielding cans are quite sturdy and snug-fitting. The first three stages of this amplifier make use of the screened grid tube, while the last can uses the 112 A type in the detector circuit. All connections to this unit are made below the subpanel by means of a five-terminal strip and a three-terminal strip, so that connecting in the amplifier is only a matter of a few moments because all connections within the Isotonic are brought out to these eight connections on the two terminal strips.

Used on Antenna

Analyzing the circuit from the schematic diagram shown in Fig. 5, it will be seen that energy enters the first detector from the antenna inductance shown at the left bottom of the diagram. While this particular model was designed for the use of an antenna as an energy collector, nevertheless, if desired, a loop with a center tap may be used by the operator. It is quite likely, however, that greater amplification and probably better distance will be obtained by using the antenna coupler, even if only a short aerial is employed.

Energy from the plate circuit of the first detector unit is fed into the grid circuit of the first intermediate frequency amplifier stage through a coupling transformer, the mixing operation having taken place through the pick-up winding of the oscillator located in the center tap of the first detector input circuit. The signal then passes in an orderly manner through plate circuit of one tube into the grid circuit of the succeeding tube and finally into

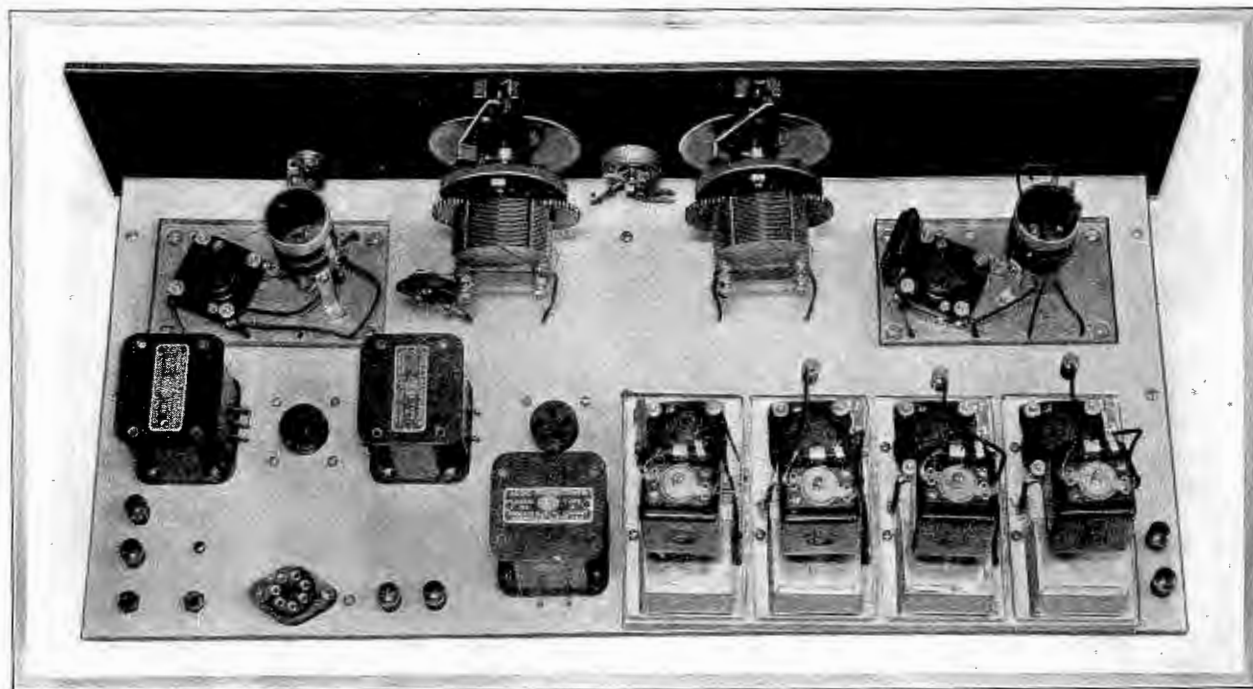


Fig. 1. Here may be seen practically all of the parts involved in the construction of this interesting super design. The large unit at the right of the rear panel is the Isotonic intermediate amplifier which is furnished ready wired

(This receiver designed, tested, and all illustrations made in our laboratory)

the second detector where it is rectified by the .00025 mfd grid condenser and five megohm grid leak. From this point it is passed on to the audio stages where it secures its maximum audible amplification.

Observation of the schematic will also show that conventional transformer coupling is employed between the plate circuit of one tube and the grid circuit of the next, with each secondary being tuned by a fixed capacity and an auxiliary capacity, the latter being of .000025 mfd and being the small trimmer capacity which may be seen at the top of the inductance cases in the photograph in Fig 1. As previously stated, between limits these trimmer capacities may be shifted up or down in order to keep the amplifier at whatever frequency the operator considers most expedient. Much of the stability of the circuit in the intermediate stages may be attributed to the presence of three 1 mfd bypass condensers located within each stage so that there is no possibility of interaction between one intermediate and its neighbor. The bias for the grids of the three 222 tubes is obtained by individual filament resistors in the negative leg of each 222 tube, the total resistance value being fifteen ohms but with a tap at ten ohms, at which tap connection is made from the grid return of the particular tube.

Single Volume Control

As a volume control and also a sensitivity method, the screened grids of the three 222 tubes are tied together and derive their potential from the 25,000 ohm potentiometer placed across the B 67½ and negative B sources. This method of control seems the simplest, inasmuch as it does not affect the grid or plate circuits of the tubes and allows these particular portions of the tube to work at maximum efficiency.

Protective Condenser

The oscillator circuit is of the conventional type, embodying an inductance in the grid and plate circuit with the tuning capacity of .0005 in series with a .0005 fixed in order to reduce the overall capacity to a .00025. This was necessary because the Remler condenser used in the design is not available in that small a capacity and the oscillator coil is designed for that particular capacity. In addition to acting as a means of reducing the overall capacity, the fixed condenser also serves as a protective meas-

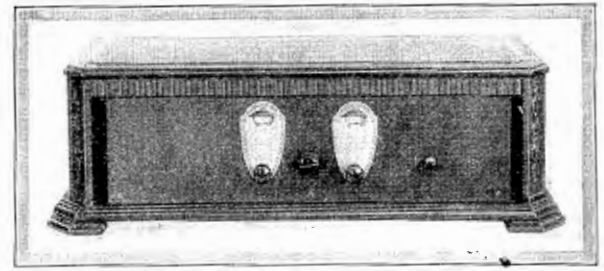


Fig. 2. The completed receiver has been placed in a cabinet to give an idea of its front panel appearance

ure in preventing the accidental shorting of the plates of the condenser and the consequent burning out of the tube. The filament circuit of the oscillator tube, which is a 201-A, is taken care of by a 4 ohm fixed resistance, while the same is true in the filament circuit of the first detector, where another 201-A tube is employed. The tuning circuit of the first detector is across the outside extremities of the inductance, where a .0005 condenser is used. The center tap of this inductance is in series with the pick-up coil of the oscillator and thence to ground. One end of the antenna inductance is grounded, while the other leads to a binding post for the aerial. If desired, however, coupling to the antenna may be made by means of a small fixed condenser between the antenna and the top terminal of the secondary of this coupler. It is also possible to use magnetic coupling between antenna and the secondary inductance, all depending upon the operating conditions experienced at the location where the set is being used.

All of the 222 tubes inside of the Isotonic screen grid amplifier are regulated by means of the 15 ohm filament resistors previously mentioned, while in the second detector a 4 ohm fixed resistance takes care of the filament of that tube. In the first audio stage a 201-A tube has a 4 ohm resistance in series with the negative side, while the 250 tube used in the last stage is energized from a 7½ volt a. c. source.

Sangamo Audios

Audio amplification is obtained by means of the Sangamo first and second stage transformers and an output choke is provided, across

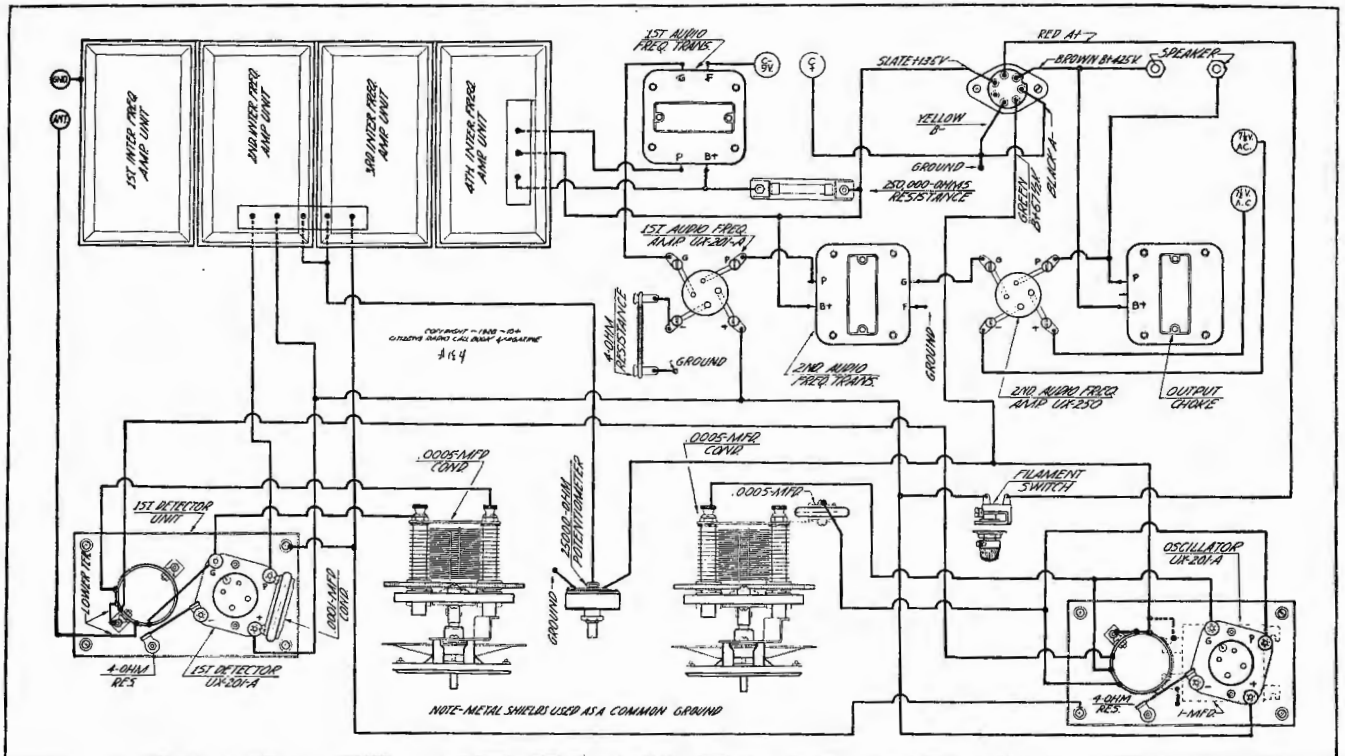


Fig. 3. The wiring of the whole receiver is quite simple, as is shown by the graphic diagram reproduced above

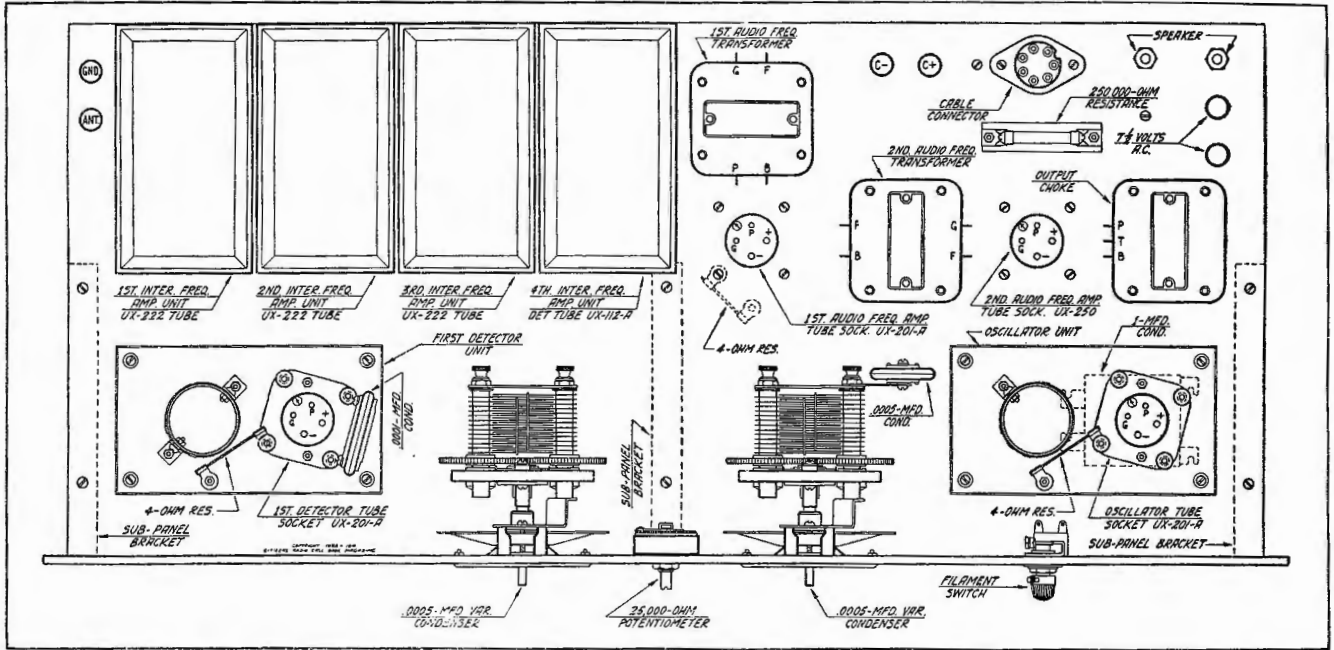


Fig. 4. All parts for the set should be laid out in strict accordance with the baseboard drawing shown here

the extremities of which are located the speaker binding posts. The bias for the 250 grid circuit should be provided by the power amplifier used with the receiver, while the bias for the grid of the first audio is derived from the C negative 9 connection on a small C battery. Plate voltage of 135 is applied to the plates of

the three screen grid tubes and the first audio amplifier, the plate of the second detector being fed with 135 volts but through a 250,000 ohm fixed resistance, so as to drop the voltage to the proper value for that particular stage. The oscillator gets 67½

(Continued on page 140)

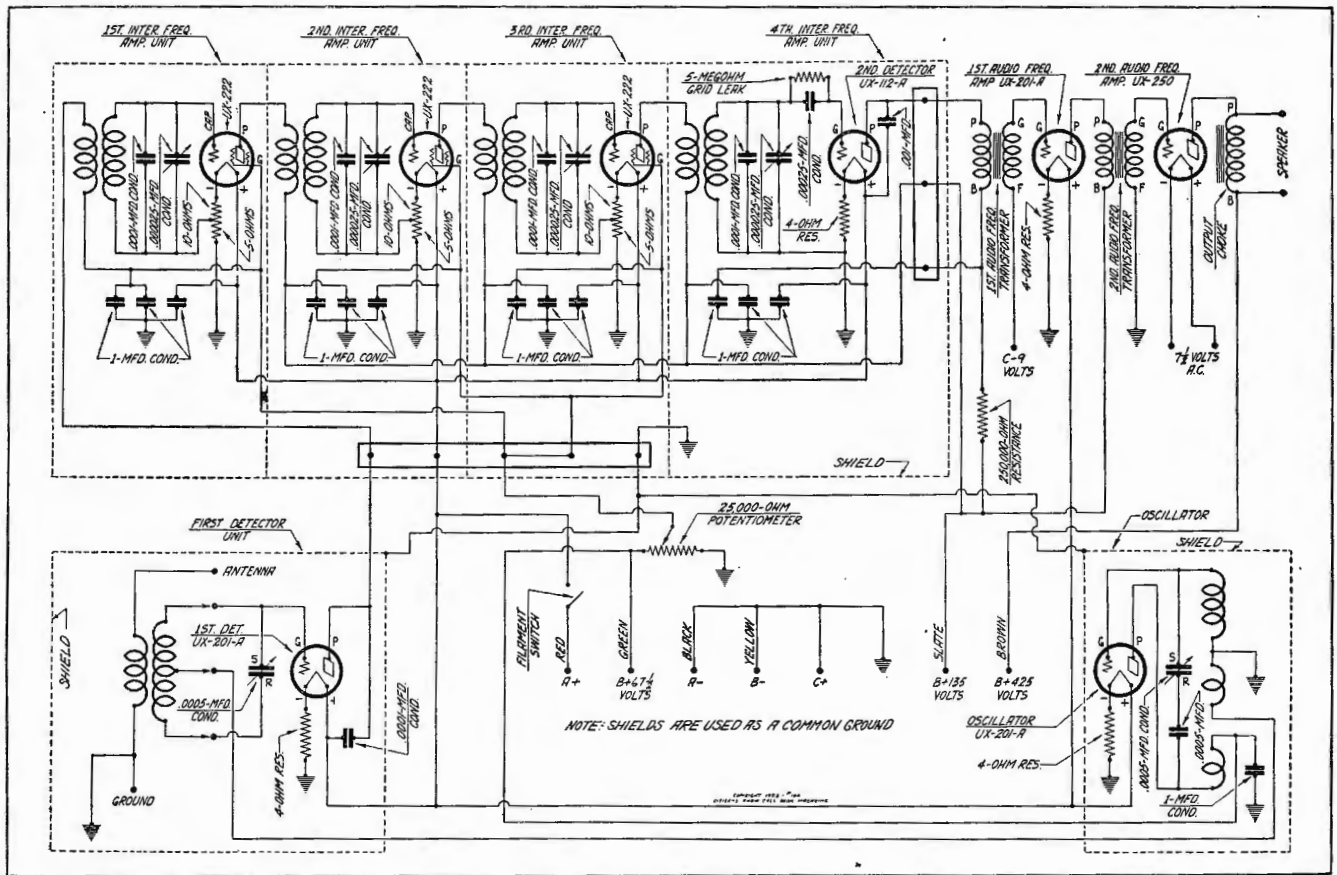


Fig. 5. The schematic circuit of the receiver is depicted above, that portion of the circuit involving the wired amplifier being shown within the four dotted line areas at the top of this drawing, the lower portion of the drawing at the left of the shield containing the first detector unit, while the dotted lines at the lower right represent the shield around the oscillator unit

Screen Grid R. F. and Regeneration in "Coast to Coast Four"

This Receiver, and the Adapter Described on Page 86 Gives
Listener Wide Reception Range

DESIGNED for either electric or battery operation, the Silver-Marshall Coast to Coast Four may be used for extensive broadcast reception on the standard wave lengths and when used in conjunction with the adapter described on page 86 will give the listener an exceptional wide reception range, both as regards distance and wave length. The particular model described in this article is the 740 a. c. Coast to Coast receiver, electrically operated. It comprises one a. c. screen grid tube used as a radio frequency amplifier followed by a regenerative detector using a 227 tube. The first audio uses another 227 tube and the power stage employs a 171 A. Audio amplification is by means of the 255 and 256 audio transformers using the Clough method of amplification.

Filament current for the screen grid tube and the heater type tubes is derived from a 2.25 filament winding, while the filament current for the 171-A is supplied from a 5 volt filament winding, both of these being available from the filament transformer made by Silver-Marshall.

Tuning Method

The antenna stage is tuned by means of a .00035 mfd tuning condenser from the cap of the screen grid tube to the ground. In the detector stage another .00035 mfd condenser is used in the input, while in the regenerative circuit a condenser of .000075 mfd is used. The proper bias for the screen grid tube is obtained by the drop across a 1,500 ohm resistor bypassed with a $\frac{1}{4}$ mfd condenser and located between the cathode of the 222 and the ground. In the detector stage a 15 ohm potentiometer

is located across the heater filaments and may be used as a hum balancer. In the first audio stage the desired grid bias is obtained by the drop across a 1,500 ohm fixed resistor between the cathode of the 227 and the ground. The same procedure is followed in the case of the 171 A, except that in addition to the 1,500 ohm fixed resistor, there is a 64 ohm center tap resistor across the 5 volt winding which gives a center tap arrangement and prevents any hum in that stage.

As a means of volume control a 3,000 ohm potentiometer from ground to B 45 is employed, the center arm of which is in series with the line to the screen grid of the first tube. A variation of this resistance will increase or decrease the volume in that particular stage. Volume may also be controlled, if desired, by means of the regenerative condenser used in the detector stage.

The receiver is simplicity itself as far as construction is concerned, since a pierced chassis is available into which may be mounted all of the necessary units. The graphic diagram shown in Fig. 3 will give the builder an idea of how the wiring should be done. Photograph in Fig. 1 gives an idea of the layout of the base board and may be followed in general for the assembly.

Parts used are shown in the following list:

- 1 Silver-Marshall 701 Universal chassis
- 1 Silver-Marshall 809 dual control escutcheon
- 1 Silver-Marshall 806L drum dial
- 1 Silver-Marshall 806R drum dial
- 2 Silver-Marshall 320R condensers
- 1 Silver-Marshall 342B .000075 midget condenser

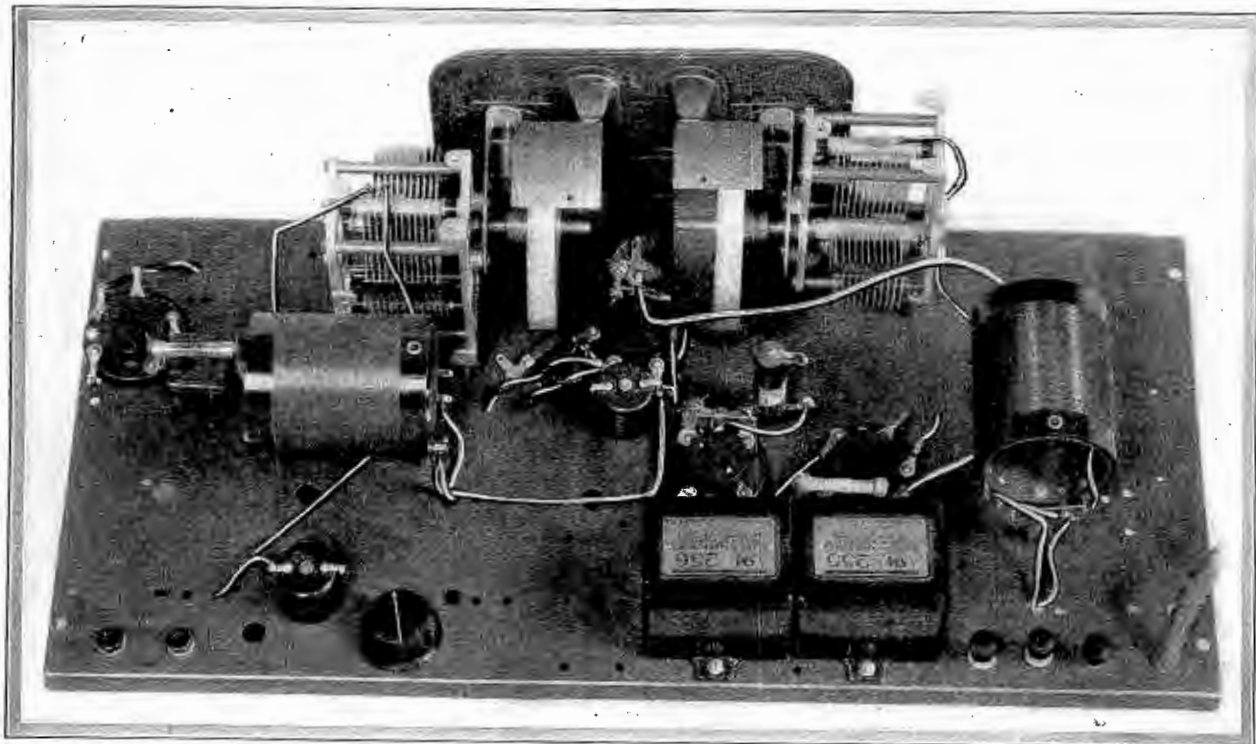


Fig. 1. This photograph shows the rear view of the "Coast to Coast Four," which is electrically operated

(This receiver tested and all illustrations made in our laboratory)

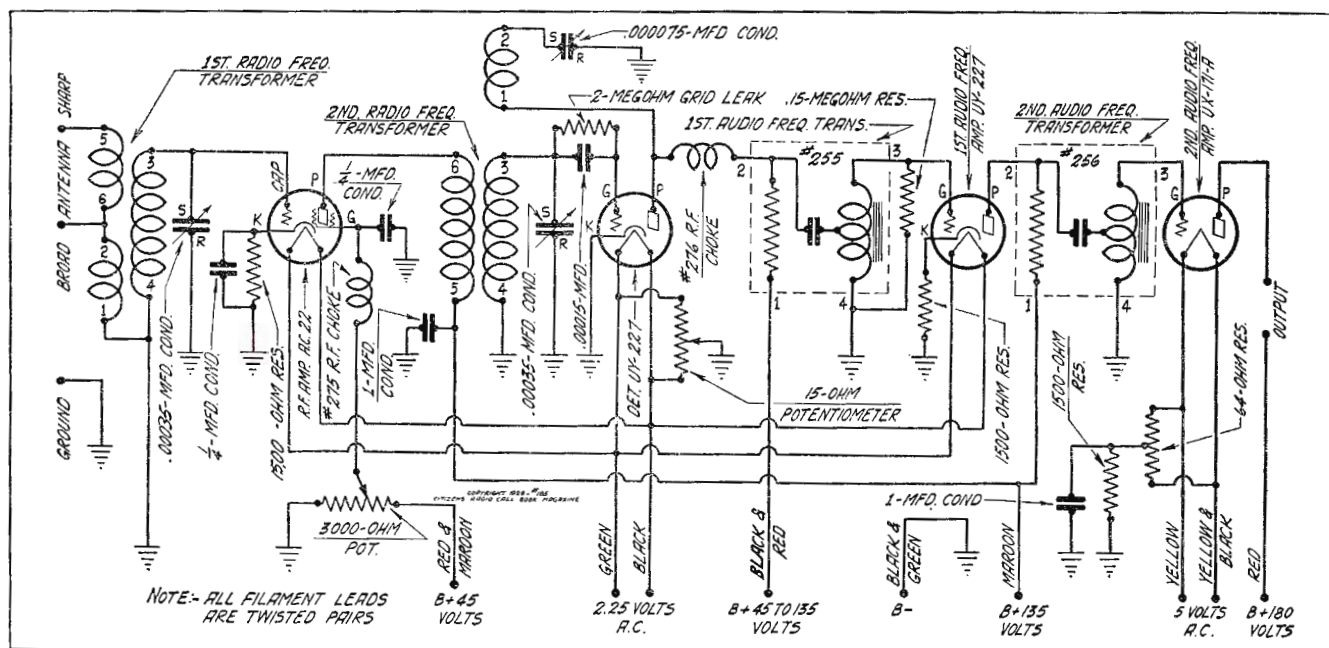


Fig. 2. The schematic circuit of the all-electric receiver is shown in the diagram printed above

- | | |
|---|--|
| 1 Silver-Marshall 708—10-lead connection cable | 1 Yaxley 840C balancing resistor |
| 1 Silver-Marshall 818 hook-up wire | 2 Yaxley No. 420 insulated tip jacks |
| 2 Silver-Marshall 140 Universal Coils | 1 Carter AP15, 15 ohm sub-base potentiometer |
| 1 Silver Marshall 275 RF choke | 1 Ohmite 1,500 ohm grid resistor |
| 1 Silver-Marshall 276 RF choke | 2 Sprague or Polymet ¼ mfd bypass condensers |
| 1 Silver-Marshall 511 tube socket | 1 Polymet .00015 grid condenser with clips |
| 3 Silver-Marshall 512 tube sockets | 1 Polymet 2 megohm grid leak |
| 1 Silver-Marshall 255 first stage A.F. transformer | 1 Durham .15 mcgohm resistor with leads (optional) |
| 1 Silver-Marshall 256 second stage A.F. transformer | 1 Potter No. 4 1 mfd bypass condenser |
| 1 Yaxley 3,000 ohm potentiometer | 1 Naald 481XS cushioned tube socket |
| 2 Yaxley 1,500 ohm grid resistors | 3 Moulded binding posts |

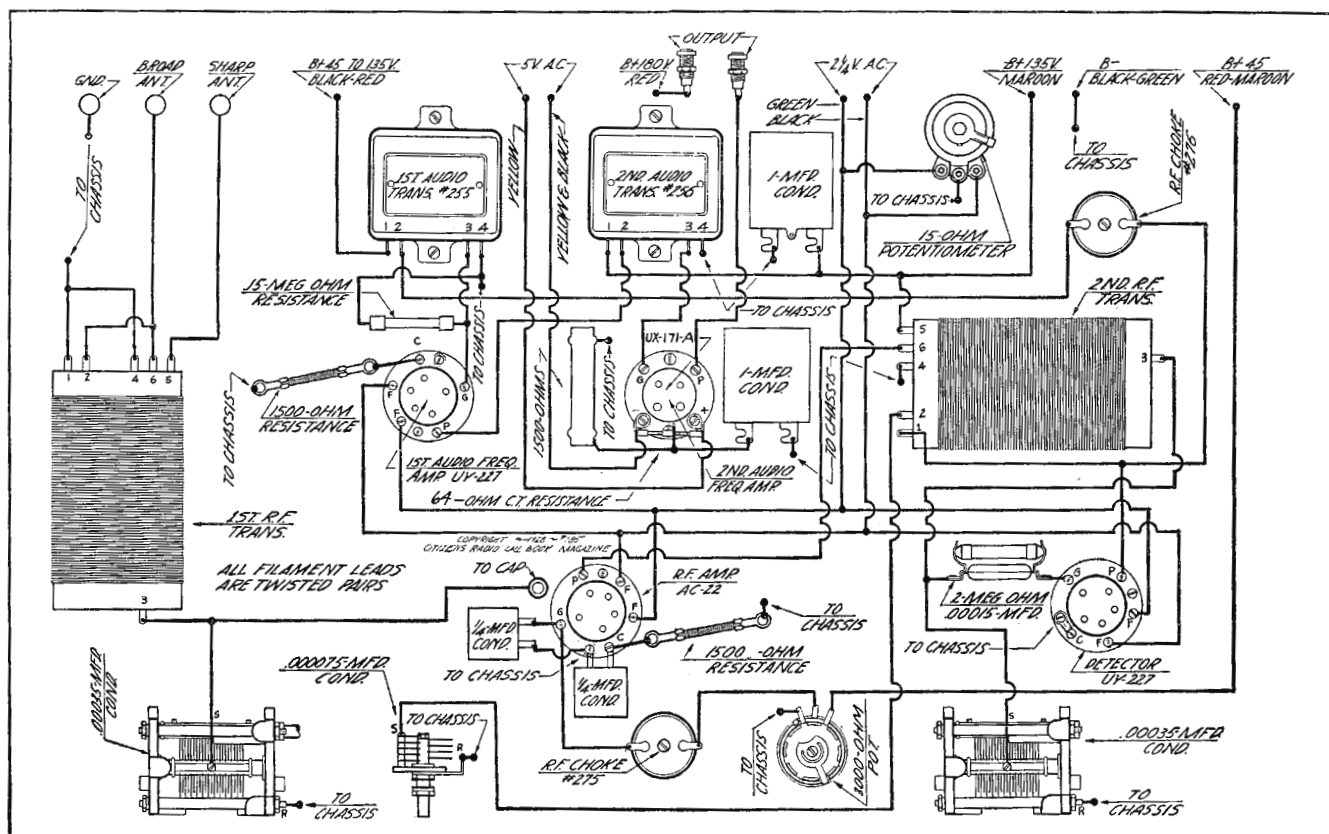


Fig. 3. All wiring may be put in by following the connections shown in the graphic diagram herewith

First Automatic Tuner Is Announced for Custom Built Market

Robertson-Davis Designs Six Tube Superheterodyne with Seven Buttons for Simple Tuning

FILLING a decided need on the part of certain types of listeners and opening up a new field of endeavor on the part of professional set builders, the Robertson-Davis automatic super six receiver has recently been announced and is fully described in the article which follows.

A. C. Operated

The receiver is entirely alternating current operated, using three stages of alternating current screen grid intermediate frequency amplification. It is completely wired and shielded, the assembly not requiring more than thirty minutes at the most.

The receiver is available to professional set builders and fans in two forms, the first being the Robertson-Davis automatic super six receiver, while the automatic tuning unit is known as the Robertson-Davis automatic electric tuner. In addition to this the power supply made by Robertson-Davis is known as their R-D audio and ABC all-electric power pack. With these three units an individual may have a simple, efficient superheterodyne giving distance and quality, together with the single control and the added feature of automatic tuning by means of buttons located in the front panel, which, when pressed, will tune in different stations for which the receiver has previously been set. These push buttons are shown in the photograph, Figure 1, while at the top of the automatic tuner may be seen the necessary capacity networks, by means of which the receiver is tuned to a definite station per button. Another view of the top of the receiver is shown in Figure 3, where it may also be observed that one of the shielded units has been removed. These units are of the plug-in type and fit into sockets in the chassis.

Uses 3 I. F. Stages

Analyzing the schematic circuit shown in Figure 4, it will be seen that the antenna circuit consists of a radio frequency transformer

No. 661, whose primary is in series with the aerial and the bottom end going to ground. The secondary of this inductance is tuned by the first section of the .0005 mfd gang condenser shown at the left in Figure 1 and Figure 2. Across this .0005 tuning condenser is a trimmer condenser to compensate for varying lengths of aerial and to insure tracking with the oscillator condenser which is the second section of the gang condenser, although the condenser rotors are not common. In series with the upper end of the first radio frequency transformer secondary is the pick-up winding of the oscillator coupler 662, which leads into the grid circuit of the first detector.

Plate Rectification

In this detector rectification is by means of the drop across the filament instead of the conventional grid leak and condenser method of rectification. The plate circuit of the first detector feeds into the primary of an intermediate transformer, 663, which is tuned at both input and output sides, this tuning being done at the factory and all units matched so that each will function at maximum efficiency in actual operation. The oscillator circuit is tuned by means of the .0005 mfd condenser in series with a fixed condenser, the two capacities being placed across the grid and filament terminals of the oscillator. The plate winding of the oscillator is in series with the plate of the No. 28 oscillator tube and derives its potential from the B 80 volt terminal of the power supply, which is also the plate supply for the first detector and the screen grid voltage of the first, second and third screen grid intermediate amplifiers. The intermediate circuits are of the conventional type, using transformer coupling for best selectivity results and with tuned input and output circuits so as to permit exact matching of all stages. The output of the last screen grid amplifier tube is fed into the grid circuit of the second detector through intermediate frequency transformer No. 666.

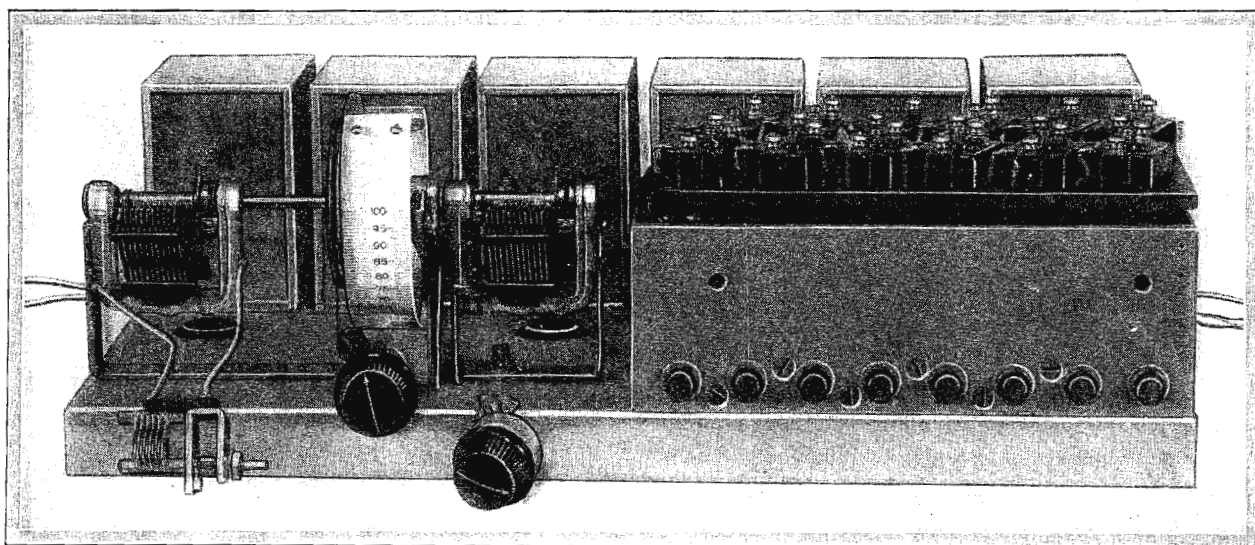


Fig. 1. In this photograph is shown at the left the single control dial, together with the midget condenser and the volume control. The buttons at the right are those by means of which automatic tuning is obtained as described in the text of this article

(This receiver tested and all illustrations made in our laboratory)

Audio In Power Supply

The second detector is the last tube in the receiver proper, since the two stages of audio amplification using push-pull 210 tubes is contained within the power supply, as is shown in the schematic circuit, Figure 5.

Simple Volume Control

Volume control for the receiver is gained by means of the 2000 ohm resistance placed across the B135 and B80 volt terminals of the power supply, the center arm of the potentiometer leading to the plate circuits of the screen grid tubes. By varying this resistance, it is possible to increase or diminish the volume of the set. A 300 ohm tapped resistance located across the A positive and the B minus is used for securing bias on all tubes, the tap supplying the screen grid biases, and the full drop for the others. It is set at the factory and is located beneath the chassis.

Push-Pull Stages

The output from the detector stage is taken into the input of the first audio amplifier shown in Figure 5 and through the plate circuit of the first audio tube No. 28 and thence into the push-pull arrangement of the 210 tubes. The output circuit of the 210 tubes is across the extremities of an output choke, the center tap of which is supplied with maximum voltage from the plate power supply. The center tap of the push-pull input circuit secures its bias from the 1000 ohm resistance between the negative B line and the center tap of the 7½ volt a. c. winding energizing the filament of the 210 tubes. The same filament supply used on the chassis proper also supplies filament voltage for the first audio tube No. 28. It is important that the lead from this filament supply transformer (R. D. 12,610) that goes to the plus terminal on the first audio socket also goes to the plus filament lead from the chassis.

Dynamic Speaker Winding

Examination of the schematic shown in Fig. 5 will disclose the fact that rectification is by means of two 281 rectifier tubes supplied from a high voltage winding, the center tap of which is the common negative B line. The positive terminal of the high voltage is the center tap of the filament winding which energizes the filaments of the 281 tubes. This positive potential line passes through a double audio frequency filter choke properly by-passed with three 2 mfd sections, the first section at the input end, one at the center and the third at the output winding. From this point the voltage divider system is placed across to the negative B terminal. The top resistor in the divider system is a 10,000 ohm semi-variable, the slider of which enables the operator to increase or decrease the overall voltage in the system and also to take care of conditions where in some cases the field of a dynamic speaker designed for 90 to 110 volts d. c. will be energized directly from the divider system. In the event that the dynamic speaker winding is not used in this position, its absence may be compensated for by the slider on the 10,000 ohm semi-variable resistor. When a dynamic field connection is not

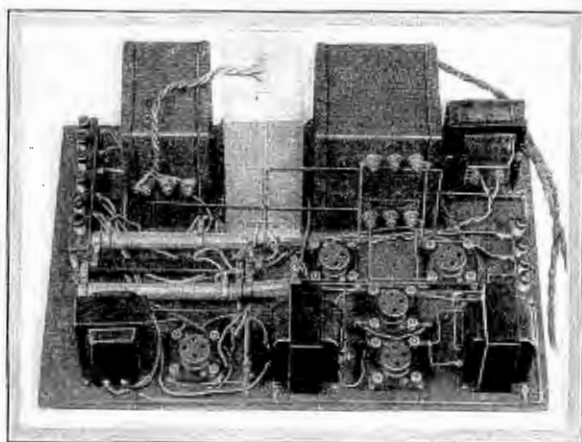


Fig. 2. The power supply designed for use in connection with the Robertson-Davis receiver is shown in the above photograph

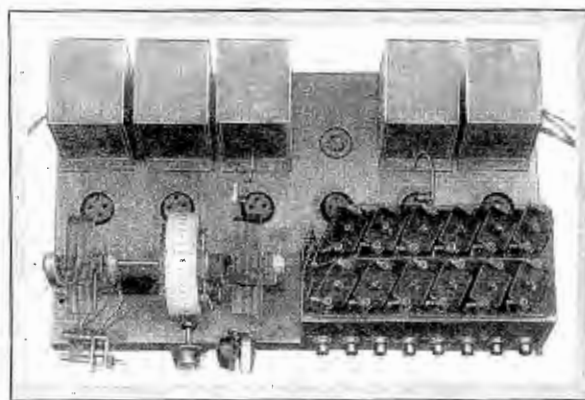


Fig. 3. This is a top view of the automatic super six with one of the shielded cans removed and also showing the top section of the automatic tuner

made, it is necessary to connect the two binding posts provided for this purpose so that the voltage divider will be continuous.

The plate circuit of the first audio tube secures its supply from the plus 135 volt terminal of the power supply, while the 80 volt terminal is provided for use of the receiver proper as may be seen in the schematic circuit, Fig. 4. Both the 135 and 80 volt potentials are obtained by the drop across portions of the 20,000 ohm resistor shown in the schematic in Fig. 5 as lying between the lower binding post of the field winding and the negative B terminal. The filament lighting transformer RD 12610 is a separate one especially for energizing the filaments of the 15 volt a. c. tubes. The high voltage transformer with its primary and secondary windings is self-contained. All of the transformer and chokes are housed in metal containers which may be grounded if desired by the operator.

The necessary steps for putting together the receiver are very few and simple. First the front panel should be mounted in position by fastening the escutcheon plate to the front panel. Three brads are necessary for this. Care should be taken in mounting the escutcheon to insure its proper alignment with the drum dial.

Next the trimmer condenser and the volume control should be added to the front panel by putting their shafts through the respective holes in the front panel and putting on the retaining nuts.

Next the six Melocouplers, Nos. 1 to 6, inclusive, should be plugged into place in their respective sockets at the rear of the chassis.

The three tuning control knobs should be connected to the three shafts by means of small locking screws.

Next three leads from the chassis assembly are connected to the tuning assembly.

After this three Arcturus No. 22 a. c. shield grid tubes and three No. 28 a. c. tubes may be plugged into their respective sockets.

The set is connected to the amplifier by means of the flexible leads which come through the rear edge of the chassis assembly.

Tuning Without Interference

After the receiver is placed in operation, it will be found that the single dial control will enable the listener to tune from one station to another without interference and without repeat points appearing on the dial. The intermediate transformers are peaked at a frequency of 465 kilocycles which the designers have found the most favorable for one spot reception, extreme distance and loud speaker volume of finest quality on either local or DX stations. Tuning is greatly simplified and no potentiometer is used. The only tuning controls are the single illuminated drum dials, the trimmer condenser used when searching for extreme distance and the volume control. No loop is required. Antenna and ground may be used if desired, but only a few inches of wire are necessary for pick-up on ordinary distance.

All of the audio amplification is performed in a separate unit and not contained in the receiver section. This eliminates trouble from magnetic fields which might interlink. The power supply

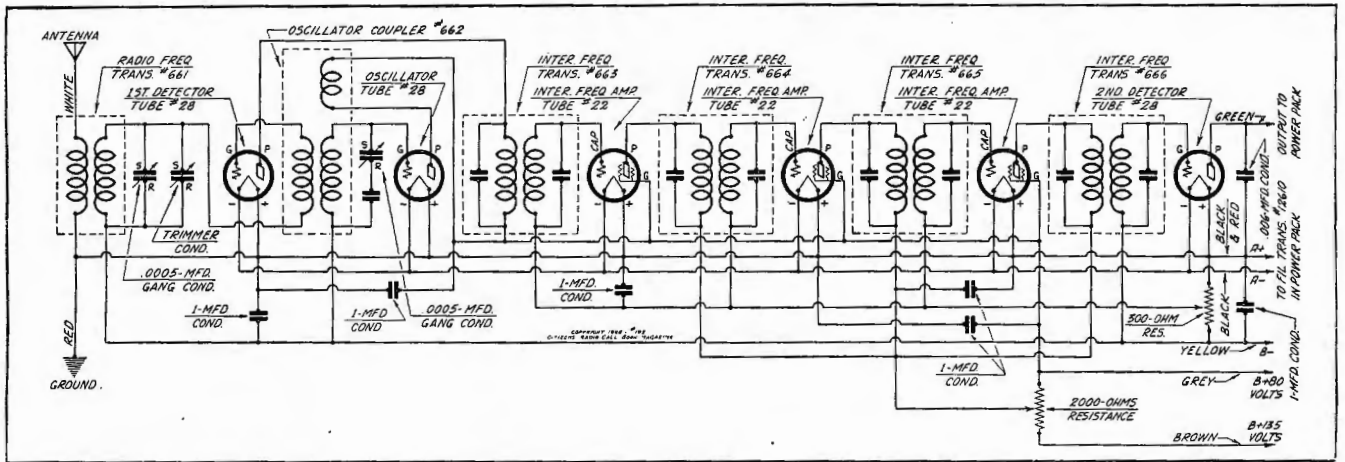


Fig. 4. The schematic circuit of the receiver is shown in the above illustration

is also equipped to use an electro magnetic phonograph pick-up if desired by the operator.

How to Work It

Automatic tuning is permitted by the automatic electric tuner, which plugs directly into the receiver. Any six stations may be selected for use on the automatic tuner and these can be changed at will. The desired station is tuned in on the drum dial and is then quickly transferred to the automatic tuner by two simple adjustments. One button controls each of the six stations and another button, the seventh, is provided for set operation from the drum dial. Then pressing any one of the seven buttons automatically cuts out all of the rest and brings in only the stations desired from the six selected on the automatic electric tuner or any other tuned in with the drum dial on the receiver.

By limiting the amplification of the intermediate transformers, the volume control automatically governs the output of the receiver. Because of this feature any desired amount of volume can be used without interfering with the performance of the receiver. The current consumption of the set is 25 milliamperes in the receiver proper, although, of course, the power amplifier has a greater current consumption on account of the use of push-pull 210 tubes.

Ten kilocycle separation between a high powered local and ex-

treame distance is assured. The receiver cannot be forced into a state of oscillation and is, therefore, free from squeals and howls. The mere interchange of antenna and oscillator coils makes it possible to cover a wave band from 20 to 550 meters, thereby adapting the set for either short wave broadcasting or television.

In certain locations, professional set builders might find that alternating current is not obtainable and for this reason Robertson-Davis have made arrangements to supply the receiver for battery operation when so desired by the customer. However, in view of the fact that the metropolitan sections are practically all in the alternating current district, it is quite likely that the a. c. model will prove the more popular of the two, although there will be occasions, of course, when the battery operated model will be more desirable on account of peculiar conditions.

Official Parts List

Parts required for the assembly of the receiver and power supply are shown below:

Receiver

- 1 Robertson-Davis chassis assembly, wired, laboratory tested and sealed in aluminum case
- 1 Robertson-Davis volume control, wired to chassis assembly with flexible leads
- 1 Robertson-Davis trimmer condenser, wired to chassis assembly with flexible leads
- 1 Robertson-Davis dial light, wired to chassis assembly with flexible leads
- 1 Robertson-Davis tuning assembly consisting of two variable condensers and one drum dial, all mounted on a special brass bracket with one shaft turning all units
- 1 Robertson-Davis walnut drilled front panel
- 1 Robertson-Davis escutcheon plate
- 3 Robertson-Davis bakelite tuning control knobs
- 6 Robertson-Davis Melocouplers Nos. 1 to 6, inclusive
- 1 Package hardware

Power Amplifier

- 1 Robertson-Davis 12,610
- 1 Robertson-Davis 12,098
- 1 Robertson-Davis 12,099
- 1 Robertson-Davis push-pull input
- 1 Robertson-Davis 12,420 push-pull output
- 1 Robertson-Davis 210 filter block 2-2-2-1-4-2-0
- 1 Robertson-Davis 1,300
- 1 Robertson-Davis 1,000 ohm grid bias resistor
- 10 Binding posts
- 5 Benjamin UX sockets
- 1 12x12 inch 3-ply baseboard
- 1 Robertson-Davis voltage divider
- 1 3-ohm semi-fixed double arm resistance
- 1 Package hardware consisting of wood screws, solder lugs, mounting screws and hex. nuts

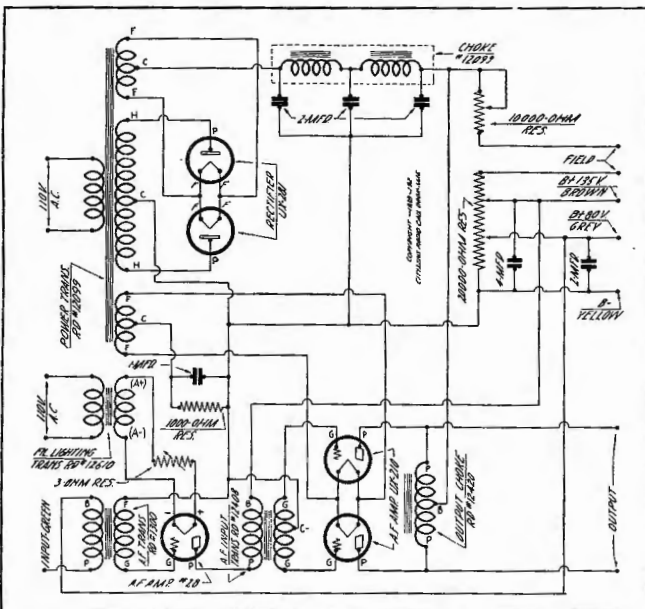


Fig. 5. Wiring of the power supply may be accomplished by following the connections shown in the schematic above

Citizens Special R. F. Seven Receiver Is Unique Circuit Design

Inductances in Filament Leads Energize Succeeding Secondaries;
No Coils in Plate Circuits

FOR experimentally inclined home set builders the radio frequency receiver about to be described in this article, and known as the Citizens Special R. F. Seven, should be of some interest. There are several features which might be appreciated by the set builder, such as four individual condensers all in a line driven by a single dial. Another feature of the circuit is the fact that the filament leads of each stage have in series with them small windings which energize the succeeding secondary stages. An inspection of the schematic shown in Fig. 5 discloses the fact that the plate circuits have no coils but are energized with ninety volts potential direct from the battery or eliminator.

Coils in Shields

All of the radio frequency stages and the detector have been located in copper cans so as to cut down the amount of external pick-up when used for local reception. In the audio end there are two stages of push-pull using the Samson symphonic transformers. An output choke or impedance is used, around which the speaker terminals are placed.

Graphic Shows Wiring

The graphic diagram shown in Fig. 4 gives the builder an idea of the construction of each of the individual radio frequency stages. In the first can there will be found a socket and an inductance, while the same is true of the second and third cans. In the fourth can, which is the detector stage, there is a socket, an inductance, a grid condenser, and a grid leak. The tuning condensers for the first three stages are located at the left of the

drum dial and insulated from the dial. The tuning stage across the detector is located to the right of the drum dial and insulated from it, insulation being insured by means of two Hammarlund flexible couplings. Each of the condenser sections has a trimmer across it so that it may be tuned to resonance by the operator. In the case of the first section which tunes the antenna circuit a manually operated trimmer in the form of a midget has been supplied which will allow the operator to change the antenna load for maximum results. In the photograph in Fig. 2 the knob at the left is the midget condenser, while the knob at the right is the combination 6 ohm rheostat and filament switch. The center knob, of course, belongs to the drum dial, which is made by National.

Saving on Wiring

Referring to the schematic circuit in Fig. 5, it will be seen that a great deal of wiring is saved by making connections to the floor of the copper cans. For example, the ground binding post is common with the can, as are the lower end of the primary coil in the antenna circuit, the lower end of the secondary coil in the first radio frequency transformer, the rotor of the .00035 mfd condenser, the rotor of the .000025 midget, the negative filament of the first r. f. amplifier, and one end of the special filament winding. The same method of connection is followed in the succeeding stages where the lower end of the secondary of the second radio frequency transformer, the rotor of the .00035 mfd condenser, the negative filament of the second r. f. amplifier and one end of the special filament winding. Then in the third stage,

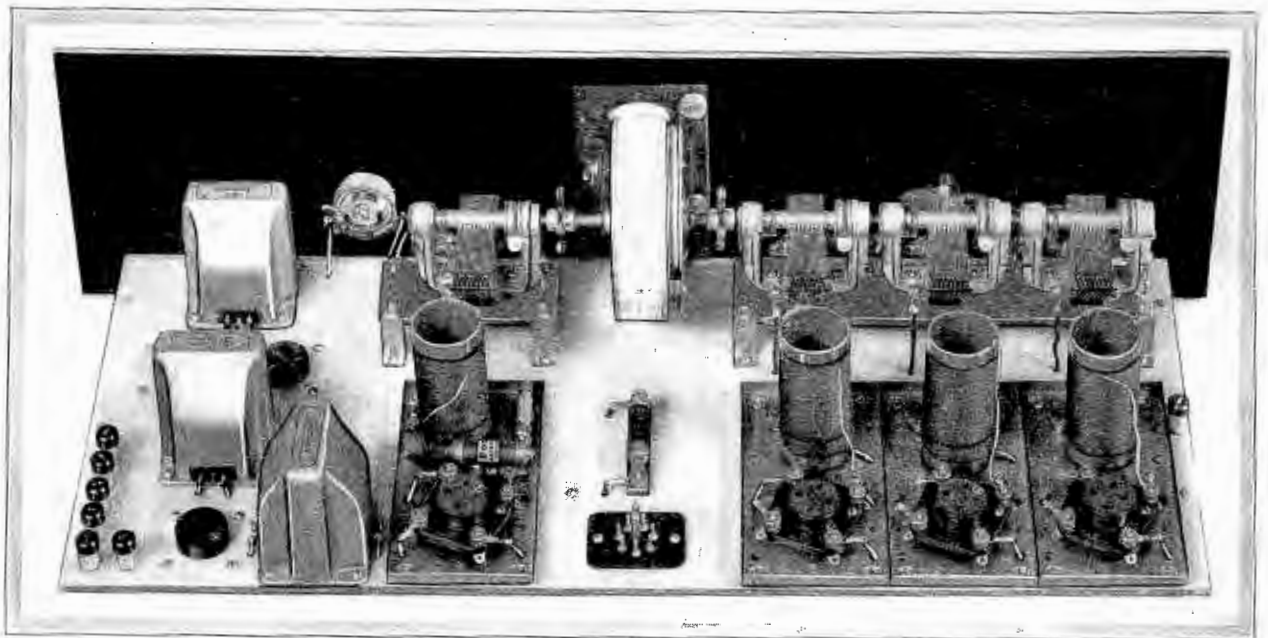


Fig. 1. In this photograph may be seen the trim appearance of the seven-tube radio frequency receiver described in the accompanying article. The r. f. stages and the detector are all placed inside of copper shields, which, however, are not shown in the photograph

(This receiver designed, tested and all illustrations made in our laboratory)

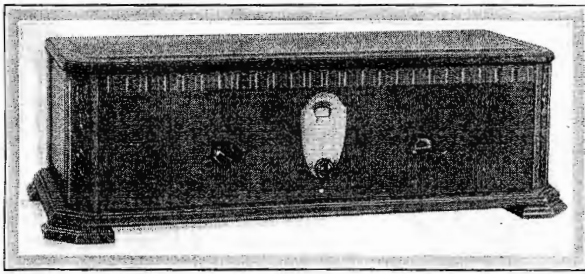


Fig. 2. The front view of the receiver may be seen by inspecting the above photograph

which is the last one tuned by the three independent variable condensers, the lower end of the secondary goes to ground, as do the rotor of the .00035 mfd variable condenser, the negative filament of the third r. f. amplifier, and one end of the special filament transformer. In the detector stage the lower end of the secondary, the rotor of the .00035 mfd, and one side of the .002 mfd bypass condenser are grounded. By the use of such a ground system considerable wire may be saved, as well as the builder's time in making connections.

Amperite Filament Control

Filament current for the first, second and third tubes is regulated by means of the 6 ohm rheostat, while the filament circuit of the detector and the first audio stage are handled by its respective Amperite. For the push-pull stages where 210 tubes are utilized, the filament supply is 7½ volts alternating current.

Plates of the third radio frequency tubes are supplied from 90 volts positive, bypassed with a ½ mfd condenser. The detector draws its current from the 67-volt terminal of the battery, while the bias on the third audio stage where a 112 A tube is used is derived from the C minus 9 terminal of the C battery. The plate circuit of the 112 A first audio tube is given 135 volts. The biasing for the grids of the 210 tubes in push-pull is supplied by an eliminator which furnishes 425 volts for the plates of these tubes, and which eliminator has in it the necessary resistor for biasing the grids of the 210's.

Inspection of the baseboard diagram shown in Fig. 3 will show the location of the three r. f. transformers of special design located in the first three shielded stages, as well as the detector inductance, which is in the fourth can from the left. It should be

observed that these coils must be mounted on small brackets to keep them from being too close to the floor of the shielded sections. Inasmuch as these coils do not have to be moved around, a single bracket on each inductance will be sufficient to hold it in position.

The stands upon which are located the three individual condensers in the left-hand section of the baseboard layout, and the single one to the right of the drum dial, are elevated from the floor of the sub-panel by mounting legs, which detail may be seen by inspecting the photograph in Fig. 1. These condensers have to be raised off the floor of the sub-panel in order that the dial may be located equi-distant between the top and bottom of the front panel. Were they located directly on the sub-panel, the knob of the vernier dial would fall too close to the bottom of the front panel and a cut-out would have to be made in the sub-panel for the drum dial to fit into. This latter operation would require more work than the construction of the shelves on which are mounted the variable condensers.

Biasing Arrangement

In the event that no such biasing arrangement has been made by the builder, then the wire leading from the C terminal of the audio frequency input transformer to the A negative line should be broken and 85 or 90 volt C battery inserted with the negative towards the C connection and the positive being made common with the B negative and A negative. However, on account of the current drain when using 210 tubes in push-pull, it is advisable that an eliminator be employed for the high voltage; and if such eliminator is employed, it is always possible to include in it, in the event it hasn't one, a resistance of the proper value to insure the rated C bias on the grids of the 210's.

Operation of the receiver is quite simple, and when it is first put into commission it should be tested on a medium strength broadcast signal until the various trimmers on the different condenser sections have been manipulated for the maximum volume. After all the small trimmers have been set, the midget condenser at the left of the panel shown in Fig. 2 may then be used as a means of finally bringing up signals to their greatest volume.

Official Parts List

Parts required for this receiver, which has been designed in the laboratory of this magazine, are shown in the following list:—

- 4 ML17 Hammarlund .00035 mfd variable condensers
- 1 Potter .00025 mfd fixed condenser

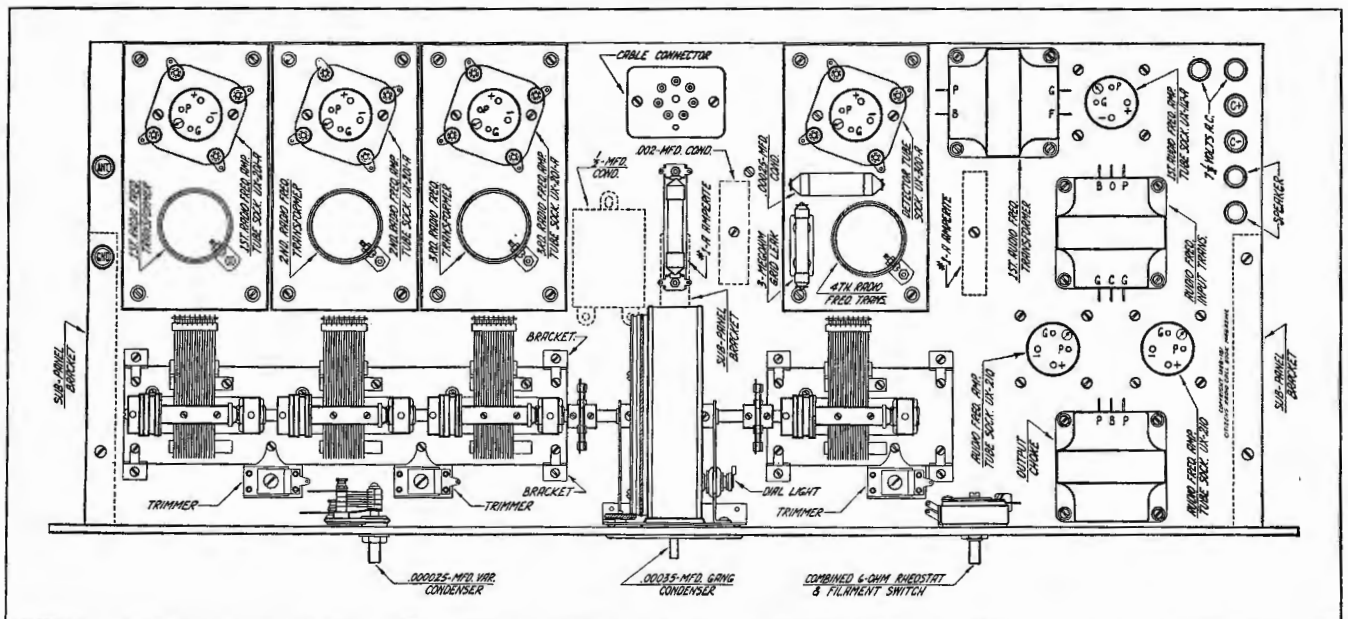


Fig. 3. Parts for the Citizens Special R. F. Seven should be laid out in accordance with the baseboard diagram printed herewith

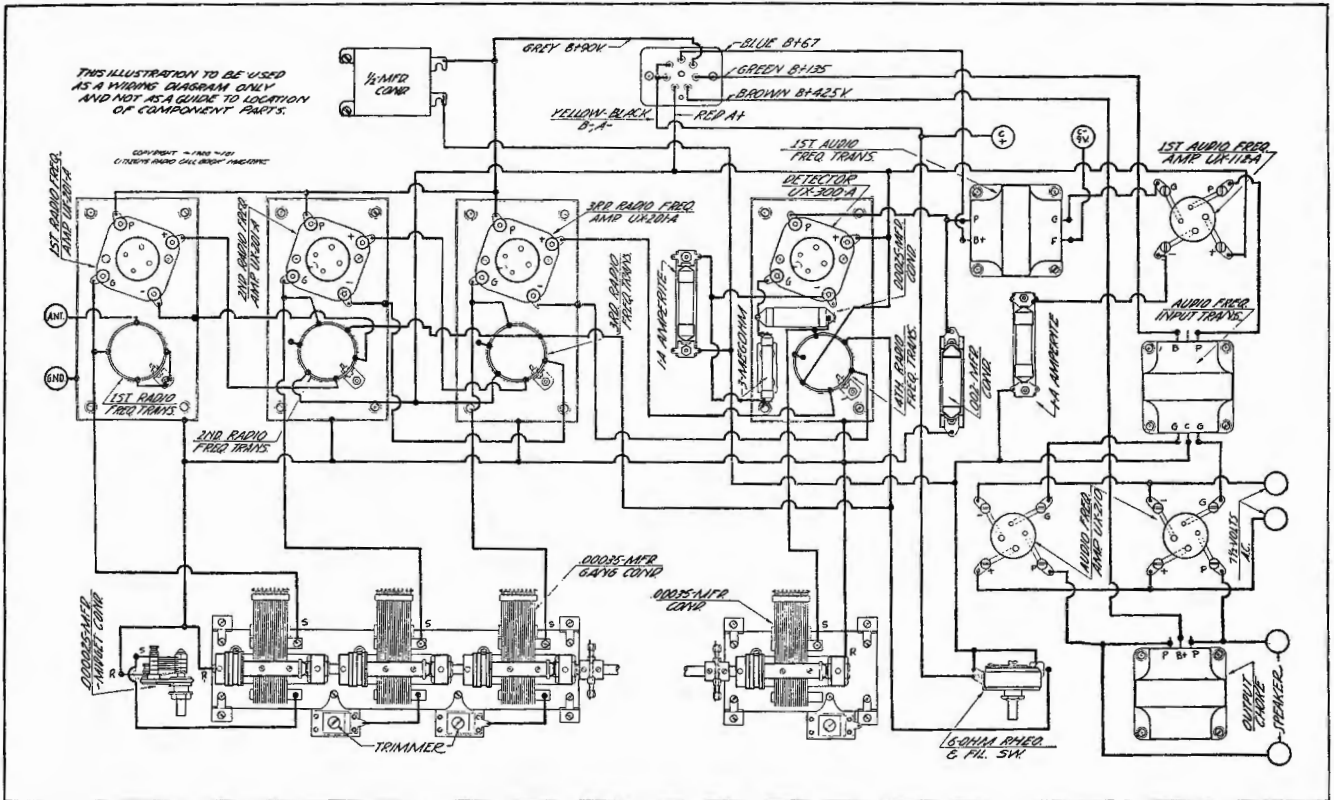


Fig. 4. All of the wiring of the receiver may be easily done by following the connections shown in graphic illustration above

- | | |
|--|---|
| 1 Potter .002 mfd fixed condenser | 4 9040 Benjamin sockets |
| 1 Type 3 Potter .5 mfd bypass condenser | 1 Type F National drum dial |
| 1 MC11 Hammarlund .00005 midget condenser | 1 720 Remler copper shields |
| 3 Hammarlund balancing condensers | 3 Karas subpanel brackets |
| 4 Birnbach special r. f. transformers | 2 Hammarlund flexible couplings |
| 1 Samson symphonic audio transformer | 3 800 Muter grid leak mountings |
| 1 Type Y Samson push-pull input transformer | 1 Package Kester radio solder |
| 1 Type Z Samson output impedance | 1 Package Corwico Braidite hook-up wire |
| 1 906-K Yaxley 6 ohm rheostat | 1 Ekko ground clamp |
| 2 1A Amperites | 3 Ceco or Sonatron 201-A tubes |
| 1 Formica 7x26x ³ / ₈ inch black front panel | 1 Ceco or Sonatron 200 tube |
| 1 Formica 10x25x ¹ / ₈ inch ivory subpanel | 1 Ceco or Sonatron 112-A tube |
| 1 600 Yaxley cable plug | 2 Ceco or Sonatron 210 tubes |
| 7 XL bakelite top binding posts | 1 Tube socket antenna |
| 3 9044 Benjamin sockets | |

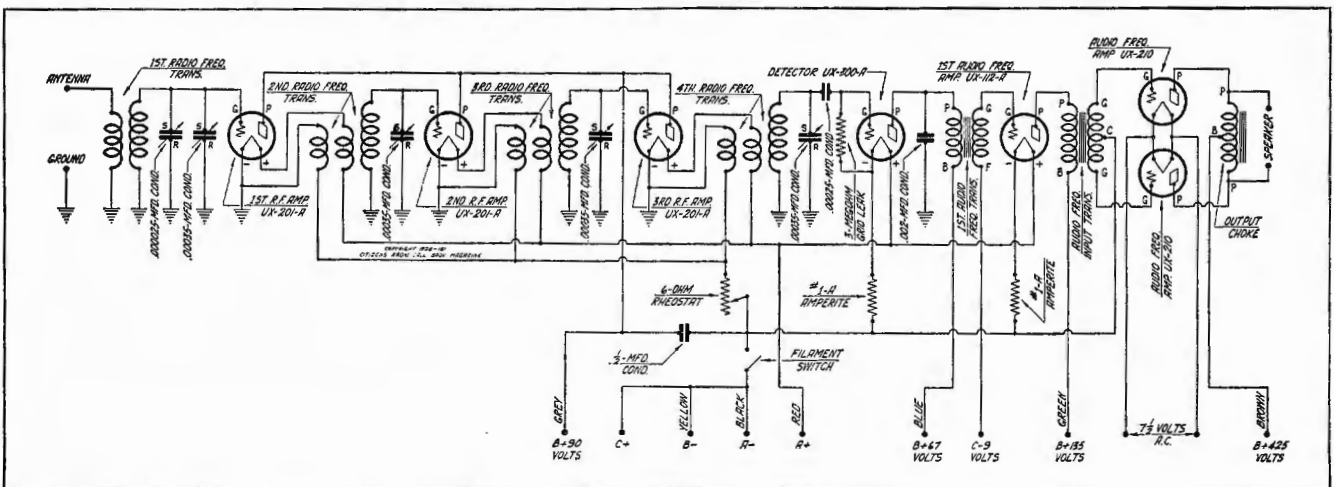


Fig. 5. This schematic circuit shows the electrical connections in the receiver and is the one by means of which the set builder should check his finished product to make sure that no errors have been made in wiring



PRACTICAL TELEVISION



CONSIDERABLE progress has been made since the last issue in the reception of television signals from Jenkins station 3XK at Washington, as well as reception of local signals in Chicago from WCFL and WIBO.

Some of the improvement in distant reception from 3XK has been due to improvements at the transmitter, better weather conditions and more effective reception methods, as well as more efficient amplifier systems.

It is understood that as soon as Mr. Jenkins has completed his new movie transmitter, it will shortly be available to broadcast stations desiring to transmit radio movies, and if this is the case, our readers may look for more sources of radio movie transmission. In the meantime, they may depend on 3XK, which is still transmitting Monday, Wednesday and Friday nights at 8 p. m. Eastern Standard Time on 46.72 meters. Our laboratory has followed these tests since their inception and will undoubtedly continue to do so for some time to come.

Television Pioneers

In a recent notice sent out by the Jenkins Laboratories, the following honor roll of pioneers receiving radio movies from 3XK



Fig. 1. Here is a photograph of the new Jenkins transmitter being used at Washington for producing radio movies and which may shortly be available to broadcast stations desiring to transmit radio movies



Fig. 2. This photograph shows the scanning mechanism and housing used at present in the laboratory for local television reception. The operator is wearing a pair of Frost head phones and monitors the received signal in order to catch any voice announcements that may be made during the program. The meter on the panel is in series with the television lamp, in order to tell when more than its rated current is being used

has been announced:

F. A. Hill, Chicago, Ill.
 G. E. Sterling, Baltimore, Md.
 Chas. Hartman, Philadelphia, Pa.
 William N. Parker, Chicago, Ill.
 Arthur V. Aykroyd, Bethlehem, Pa.
 Reuben M. Outten, Felton, Del.
 Howard Adams, Jr., Baltimore, Md.
 James Millen, Malden, Mass.
 P. S. Hendricks, Wiamo, Mass.
 Raymond Morgan, Philadelphia, Pa.
 Paul Zerrahn, Belmont, Mass.
 Boyd Phelps, Jamaica, L. I., N. Y.
 Clifford Fraser, Bridgeport, Conn.
 Harry M. Yingst, Harrisburg, Pa.
 R. F. Schierland, Cincinnati, O.
 P. W. Heasley, Akron, O.

The new transmitter built by Mr. Jenkins and referred to previously in this article is shown in the photograph, Figure 1, to



Fig. 3. Those who have followed 3XK radio movie transmission will remember the picture of a girl bouncing a ball, which has been standard

gether with its inventor, who recently spent some time in Chicago during the Radio Show, where he was invited to attend a meeting of the Television Standardization Committee named by the Radio Manufacturers Association.

Portable Scanner

The first model of our scanoscope, or television cabinet, is shown in the photograph in Figure 2. While it appears bulky, nevertheless it was constructed in this fashion so that it might be self-contained and portable for moving about from one location to another. As will be seen in the photograph, the aperture through which the operator watches the scanning disc frame is at the top center. In back of this oblong opening is a National scanning disc driven by a Bodine motor, the light from the Raytheon television lamp being observed through the holes in the scanning disc. The circuit diagram of the unit is shown in Figure 11 and consists of 180 volts of battery for the television lamp, fixed and variable Truvolt resistors for altering the current through the lamp and a Weston 0-50 milliammeter for registering lamp current. The push buttons on the lower panel in Figure 2 are shorting buttons across a series resistor in the motor line, so that the disc may be kicked ahead in order to maintain synchronism. This particular unit has to be operated in the laboratory on direct current, whereas in most of the experimenters' homes alternating current is available. The Bodine motor is working very satisfactorily and synchronism may be easily retained after a little practice on the part of the operator.

Movie Frames

For the benefit of those who have not seen the Jenkins radio movies and to refresh the memory of those who have, we are showing six typical frames from as many reels. The first one is in Figure 3, showing a girl bouncing a ball, this particular subject being better known than almost any other because it is used more frequently for test purposes by Mr. Jenkins. In Figure 4 may be seen the silhouette of a girl skipping rope, in Figure 5 a little girl imitating her mother, in Figure 6 a child hanging out clothes on a line, Figure 7 being symbolical of "Little Boy Blue" and Figure 8 a child kicking someone's hat. There are other subjects besides these, the new subjects being made from week to week by the Jenkins Laboratories. However, the foregoing six frames will give one an idea of what may be expected in radio movies at the present time. Later on, as the number of listeners increases, it is anticipated that more difficult subjects will be transmitted from Washington.

Simple Television Amplifier

As a means of getting extremely good amplification in a simple manner and one that has been sufficiently good for amplification of the images received from 3XK, our laboratory has recently utilized the Thordarson screen grid amplifier described on page 112 of the March, 1928, issue of this magazine. While the original model might be used if desired, nevertheless a few changes were made in it so as to simplify its operation for television purposes. For example: in the schematic shown in Fig. 10, an R-196 choke has been placed in series with the plate ahead of the R-76 output transformer, whose secondary winding carries the head phones for monitoring purposes. The presence of this choke serves to accentuate the images by making that particular circuit



Fig. 5. This young lady is imitating her mother in donning war paint

more resistant to the signal than if only the R-76 were kept in there. Instead of using a fixed bias on the grid of the 171, a 3000 ohm Truvolt has been employed, as well as two other Truvalts, one being a 10,000 ohm variable and the other being a 5,000 ohm variable. These Truvalts are shown in the rear of the panel illustrated in the photograph in Fig. 9. The output stage has an addition in the form of a 1 mfd 400 volt condenser between the plate of the 171 and one terminal of the scanoscope input, the latter being shown diagrammatically in Fig. 11.

Furnishes Plate Voltages

Thus, the screen grid amplifier which is operated with a Raytheon 125MA rectifier tube furnishes plate supply for the 222 screen grid tube, the 171-A power amplifier and the regenerative circuit plate voltage of the receiver ahead, which receiver at the present time is identical to the one shown on pages 88 and 89 of the present issue. When used for television purposes, the screen grid voltage of the receiver and the plate voltage of the screen grid tube are supplied from dry batteries, but the supply for the regenerative detector is from the Thordarson screen grid amplifier. This is a more satisfactory arrangement than trying to operate the entire receiver from a single power supply on account of the possibility of hum.

Parts For Amplifier

Parts required for the construction of a Thordarson screen grid amplifier similar to the one now being used in our television reception are shown below:

- 1 301 Tobe 1 mfd filter condenser
- 3 225 Tobe .25 mfd bypass condensers
- 1 201 Tobe 1 mfd bypass condensers
- 1 171 Tobe filter condenser block
- 4 Thordarson autoformers
- 1 R176 Thordarson output transformer
- 1 R-171 Thordarson high voltage transformer unit
- 1 R-196 Thordarson choke
- 1 810 Yaxley 15 ohm fixed resistance
- 1 815 Yaxley 10 ohm fixed resistance
- 1 T100 Electrad 10,000 ohm Truvolt variable resistance
- 1 T50 Electrad 5,000 ohm Truvolt variable resistance
- 1 T30 Electrad 3,000 ohm Truvolt variable resistance
- 1 Formica 7x24x1/8 inches black front panel
- 1 Formica 7x21x1/8 inches black sub-panel
- 7 X-L bakelite binding posts
- 3 9044 Benjamin UX sockets
- 1 10 Yaxley filament switch
- 1 110 Carter a. c. switch
- 1 Ceco or Sonatron 222 tube
- 1 Ceco or Sonatron 171-A tube
- 1 Raytheon BH125 MA rectifier tube

Parts For Scanoscope

In the construction of the scanoscope unit shown in Fig. 11, there will be required one Jewell or Weston O-50 milliammeter, one Electrad 5,000 ohm Truvolt, one Electrad 5,000 ohm fixed Truvolt, one Thordarson R-196 choke and a Raytheon Kino-lamp, in addition to the Bodine motor and the National scanning disc, the latter being of 48 holes, which by this time is practically standard in television circles.

Resistance Amplifier

In the resistance coupled amplifier shown schematically in Fig. 12, the fixed resistors are made by Allen-Bradley, the filament controls are Amperites, coupling condensers are



Fig. 6. This silhouette is one of a child hanging up clothes



Fig. 7. This frame of the radio movie represents "Little Boy Blue"



Fig. 8. In this movie reel the young lady is kicking somebody's hat

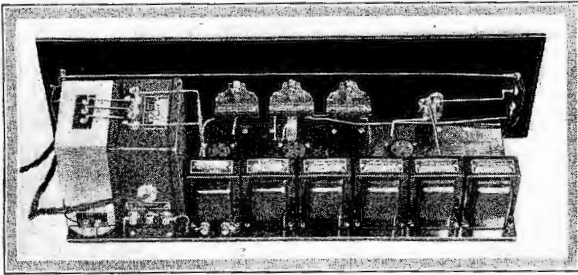


Fig. 9. This television amplifier and power supply has recently been used by our laboratory on the Jenkins tests

made by Acme, the audio frequency choke in the input circuit is made by Samson, as is the audio choke in the plate circuit of the 112-A tube. The radio frequency choke and the audio frequency chokes in the grid circuit of the 171 tube are made by Samson, the r. f. choke being 500 MH and the audio choke being type G. The audio choke in series with the television lamp circuit is also made by Samson and is used to prevent energy getting back into the battery circuit. The monitoring circuit includes the use of two Carter 1 mfd round condensers and a pair of Frost head phones, these being located in parallel to the 5,000 ohm resistor in the plate circuit of the 112-A tube.

Other methods of coupling the television lamp in the circuit are described further along in the article in this issue.

Television Power Supply Unit

Some inquiries have already been received for a television power supply which will give pure direct current without any impurities. The amplifier shown photographically in Fig. 13 and schematically in Fig. 14 has been designed with a view to providing a plate supply that is free from hum or modulation.

The satisfactory operation of any power amplifier combination rests upon proper filtering of the output of the rectifier system. In the schematic shown in Fig. 14 it will be seen that there are two extra R-196 a. f. chokes in series and properly bypassed so as to insure absolutely clean cut direct current. Another feature

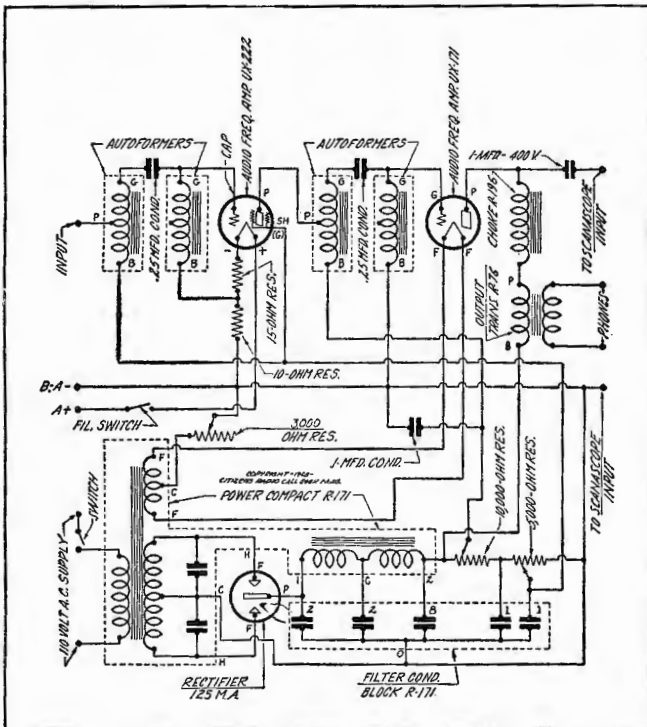


Fig. 10. The schematic circuit of the combined amplifier and power supply is shown in this diagram, the succeeding diagram being that of the television lamp circuit

of the amplifier described is the fact that by means of the Truvolt divider, it is possible to secure quite a number of voltage ranges both in plate supply and grid bias.

Parts required for the construction of the television power supply shown in Figs. 13 and 14 are as follows:

- 1 Thordarson 210 power compact
- 1 Thordarson 211 steel baseboard
- 2 Thordarson R-196 chokes
- 1 Tobe 210 condenser block
- 2 Tobe 400 volt 2 mfd condensers
- 1 Electrad Truvolt divider
- 1 Electrad Truvolt multiplier

Different Multiplier Values

The Truvolt multiplier is shown as resistance A in the schematic, Fig. 14, and when this divider is purchased there will be found a booklet inside the carton which explains the method by which the builder determines the value of such a multiplier resistance. Inasmuch as this multiplier resistance varies with the installation and with the use to which the power supply is to be put, it is necessary for each builder to determine for himself the

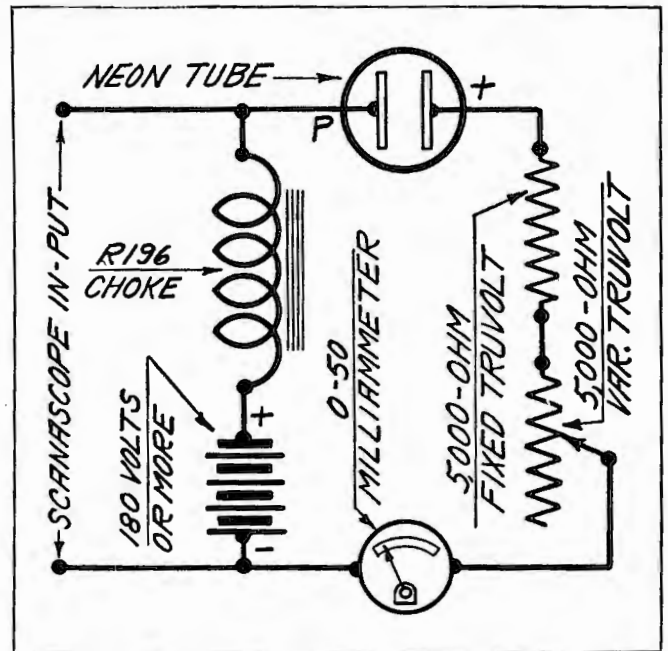


Fig. 11. This schematic represents the television lamp circuit, the scanscope input going across the output terminals on the amplifier shown in Figure 10

exact value of the resistance marked A in the schematic diagram. However, in the booklet accompanying the Truvolt divider, there are tables provided which will immediately show the builder what value to use in that particular position.

Data On Kino Lamps

In a recent data sheet issued by Raytheon covering the operation of their Kino-lamp there are several optional methods of connections for the television lamp in a circuit.

These methods are shown schematically in Figs. 15, 16, 17 and 18, while Fig. 19 shows the location of front and rear plates in the Kino-lamp.

Since the dynamic impedance of the Raytheon television lamp has been changed from 1,200 ohms to 500 ohms, these lamps may be used directly in the plate circuit of a 171-A power tube.

Getting Deeper Modulation

For those who are seeking as much amplification as possible, we would suggest that reference be made to the schematic cir-

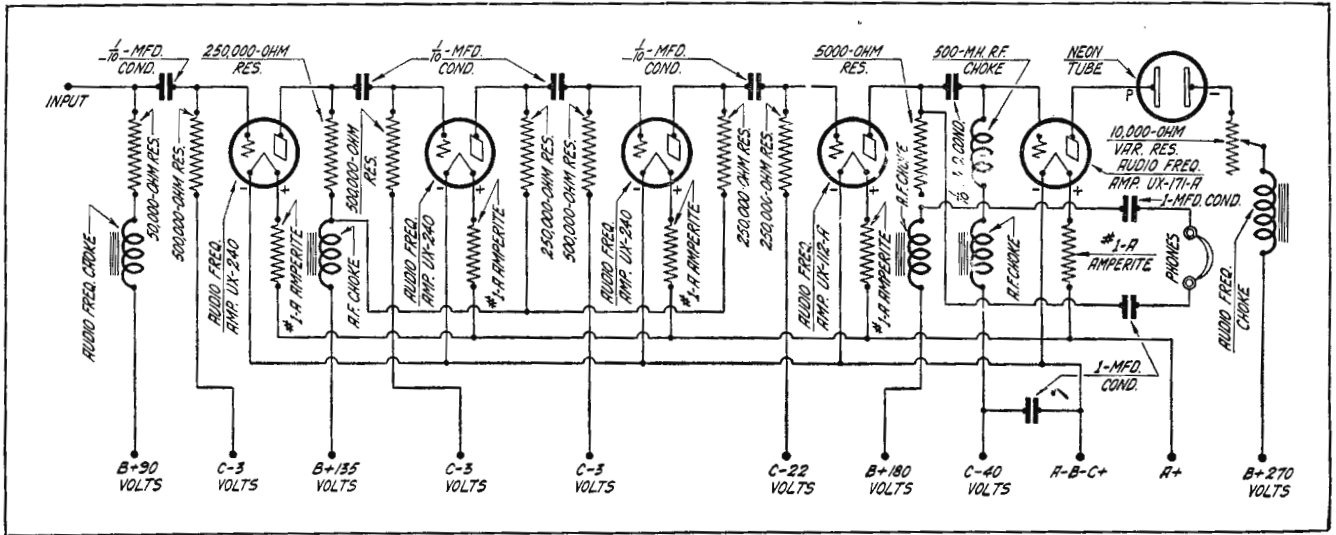


Fig. 12. This schematic shows another method of amplification and television lamp coupling used with success during the early reception of signals from 3XK

cuit in Fig. 10 in this department and if they are having any difficulty in getting sufficiently deep modulation on the television lamp they can improve matters somewhat by removing the 9-196 and R-76 from the plate circuit of the 171-A and substituting therefor the Raytheon Kino-lamp with a 5,000 ohm variable Tru-volt resistance in series with it. While it is true that the inclusion of the television lamp directly in the plate circuit of the 171-A might reverse the image which operators have been getting when Fig. 10 and 11 units are combined, nevertheless, the depth of modulation is much greater and better results may be secured on weaker signals. For all practical purposes the layout shown in Fig. 10 and 11 may be followed with quite satisfactory results, but if still more activity is desired in the television lamp, it may be connected as previously described.

It would be well to remember in connection with the above procedure that the tube should not carry more than 20 mills and for that reason it would be advisable to include a 0-50 d. c. milliammeter in series with the lamp to make sure that 20 mills is not exceeded. On recent test it is found that with a television lamp directly in a 171-A circuit and the current adjusted for 20 mills that a swing of the 171-A tube will cause a rise in current of approximately 5 to 6 milliamperes in the television lamp, this occurring during strong interrupted signals such as telegraph code. By the same token this increased swing gives a better

image when signals from 3XK at Washington are being received.

Optional Connection Methods

The optional methods of connection for a Kino-lamp are excerpts from the data sheet accompanying these tubes and are given here in order to show as many means of connection as are possible.

In Fig. 15 is shown the simplest method of connecting a television lamp in the circuit, this being a series connection with a B battery of the value required for the particular tube, which in this case would be a 171-A power tube. Of course in this method there are no refining controls and no protective measure for preventing the television lamp from taking more current than the value for which it is rated. Consequently this schematic only has interest from the standpoint of showing the simplest way, but not necessarily the most efficient way of hooking up a television lamp.

Another method which has been followed with success by many experimenters is shown in Fig. 16 where the plate circuit of the power tube is isolated from the television circuit by means of the fixed condenser shown in the diagram. The 30 henry chokes shown in this schematic may be eliminated and resistances used instead, providing resistances are available which will carry the required current in each respective circuit.

Still another means by which the television lamp may be connected is disclosed in Fig. 17 where a polarizing battery of ap-

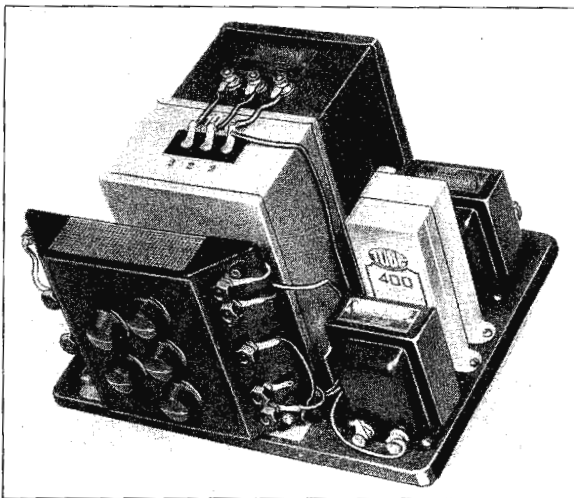


Fig. 13. In this power amplifier, which uses a Tru-volt voltage divider, extra filtration has been provided so as to assure absence of ripple which might modulate the television lamp

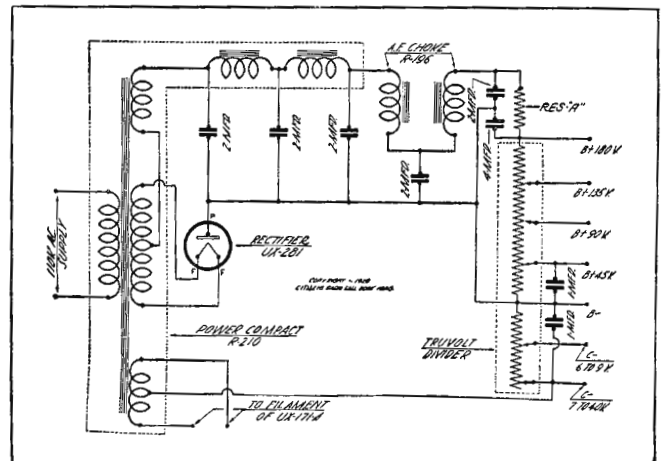
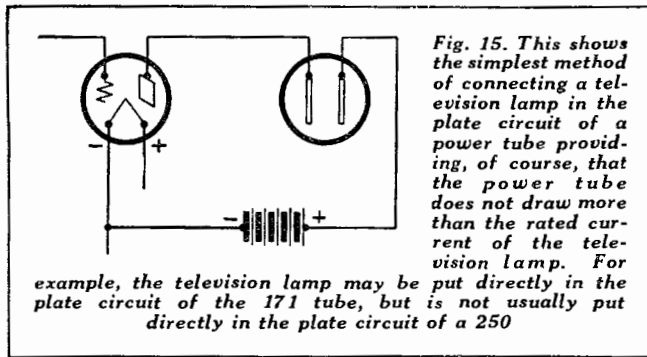


Fig. 14. The schematic circuit of this television power supply is shown in the above diagram



proximately 45 to 90 volts is so connected that it reinforces the potential on the television lamp. In this arrangement it is necessary to have a 1,000 ohm variable resistance to cut down the current drawn by the lamp itself. The 60 henry choke in series with the plate of the power tube permits one to adjust the power tube plate circuit for its best value, and the resistance allows adjusting of the television lamp circuit regardless of the adjustment for the power tube.

An ignition battery is shown in Fig. 18 as a means of starting the neon tube with the expectation that the potential built up across the fixed condenser in the circuit will maintain the television lamp in operation.

Each of the television lamps have two plates, one being connected to the "P" terminal of the standard socket and the other to the negative terminal of the socket. These are the connections used by Raytheon in their Kino-lamp and may be assumed to be standard.

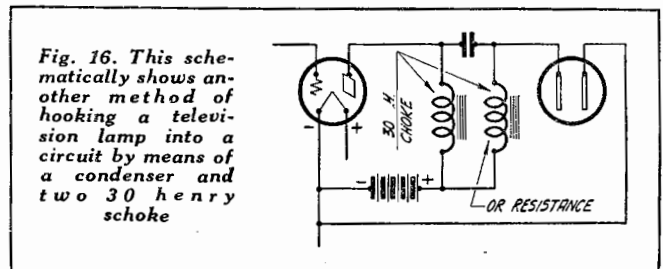
Monitoring Circuit

Another method of hooking up a neon tube may be seen in the schematic circuit shown in Fig. 20 where a method is provided for monitoring by means of a pair of headphones across two fixed condensers across the windings of a 30 henry audio choke. The second 30 henry audio choke gives a total of 60 henrys in the circuit, is sufficient impedance to force quite variations of the 171-A through the television lamp. In this diagram the polarizing battery is used and this method has been used with some success for reception from 3XK. The 171-A circuit is an independent one, with its grid input provided with a 500 M. H. radio fre-

quency choke and a type "G" audio frequency choke, these two being made by Samson. The output of the preceding tube is impressed on the grid of the 171-A through a suitable mfd coupling condenser.

Automatic Disc Control

Considerable interest was shown at the New York Radio Show in an automatic scanning disc control mechanism recently designed by Clarostat and for which the manufacturer claims practical speed control. This device consists of a 1/25 h. p. high speed type motor with suitable reduction gearing and flexible coupling for driving the scanning disc. On the motor shaft is mounted a special centrifugal governor actuating a pair of contact points in series with the motor current supply. The contact points are shunted by an adjustable resistance. Thus when the speed of the motor arises above a given point, the centrifugal governor opens the contact points, thereby reducing the current to the extent of



the resistance then thrown into the circuit. As the speed of the motor falls below a given point, the contact points close short circuiting the resistance and restoring full current to the motor.

Two special power Clarostats are used for the controls obtaining any desired speed and also for trimming the sparking at the contact points by varying the degree of short-circuited resistance. The connections of the power Clarostat are at the front end of the motor base, at the right in photograph, Fig. 21. In addition there is a small knob for adjusting the contact points which serves as a vernier in obtaining precise speed, the manufacturer claiming control to one revolution.

Provision is made for mounting any scanning disc on the driving shaft. The Kino-lamp is mounted on an adjustable platform, which by means of rack and pinion movements may be micro-metrically raised or lowered, as well as shifted from side to side.

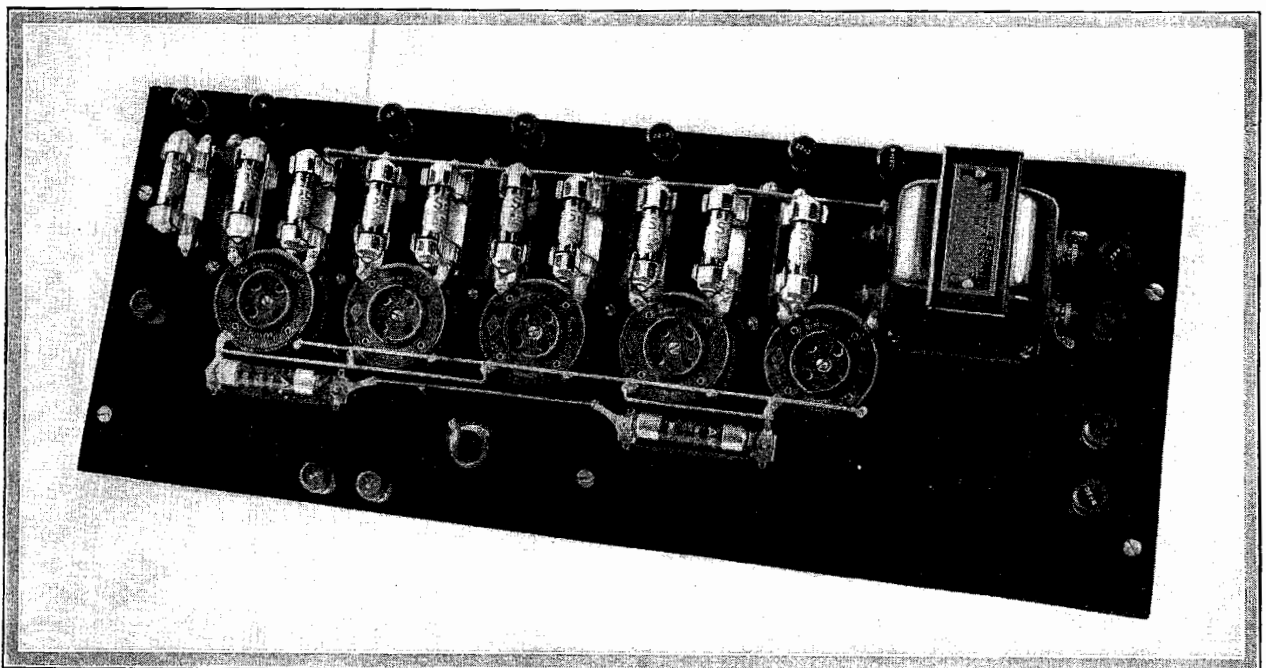


Fig. 22. This photograph shows a resistance coupled television amplifier made up from parts manufactured by Amseo, which unit for a time was used in reception of signals from Jenkins at Washington

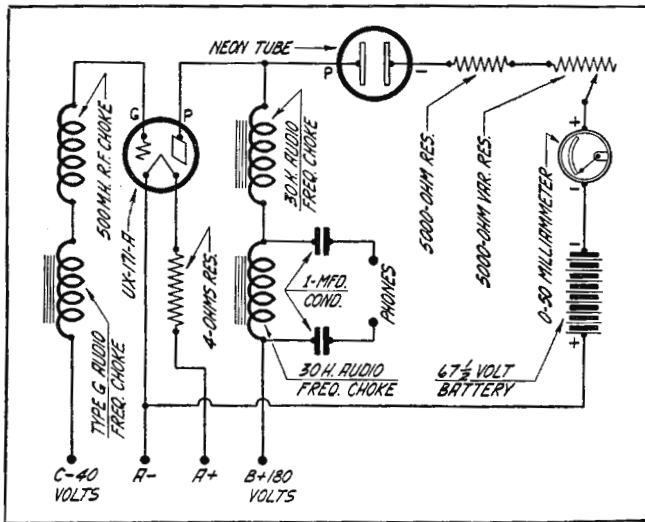


Fig. 20. The schematic circuit shown above is another method of hooking in a television lamp in a circuit and also showing the means by which a pair of headphones may be used to monitor the incoming program

The manufacturer states that in operation the speed control knob is adjusted for the necessary speed, which may be anything from a few revolutions to many hundreds. Vernier or delicate revolutions within a single revolution or less are made with a small knob that regulates the contact points. Finally the sparking at the contact points is reduced by the knob controlling the short circuited resistance into sparking is almost imperceptible.

In the special television resistance coupled amplifier shown photographically in Fig. 22 the values of coupling condenser and

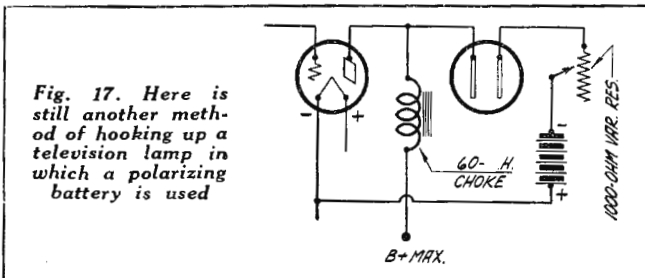


Fig. 17. Here is still another method of hooking up a television lamp in which a polarizing battery is used

resistance are the same as those shown in the schematic in Fig. 12. In order to permit flexibility it is quite necessary that separate "C" biases and plate voltages be allowed, although for average purposes the plate supply on the high- μ tubes may be 135 through the coupling resistors specified. The Absco couplers have a coupling condenser inside of the coupler and are obtainable in 1/10 mfd values, if desired. Filament control in this amplifier is by means of Amperites.

Television Demonstration Sets

Many dealers, in order to capitalize on the public interest in

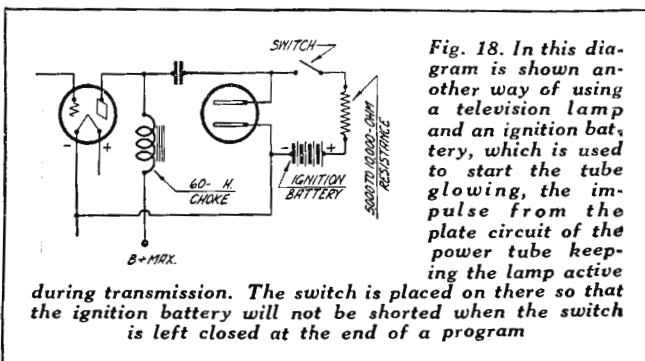


Fig. 18. In this diagram is shown another way of using a television lamp and an ignition battery, which is used to start the tube glowing, the impulse from the plate circuit of the power tube keeping the lamp active during transmission. The switch is placed on there so that the ignition battery will not be shorted when the switch is left closed at the end of a program

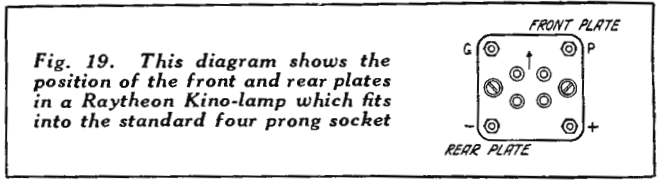


Fig. 19. This diagram shows the position of the front and rear plates in a Raytheon Kino-lamp which fits into the standard four prong socket

television, have installed television receivers for demonstration purposes and one company is now marketing devices of that type. The Daven Corporation at Newark, N. J., are making up a special television receiver, completely wired and including a neon tube, disc, rheostat, bushing, cables, motor and the T-4 amplifier unit, the latter being attached to the output of the detector tube of a short or long wave radio set. This constitutes the complete television set which will receive pictures requiring 24, 36 and 48 apertures. Inasmuch as the disc already has the three spirals on there it is only necessary that the television lamp be raised or lowered on a standard inside the cabinet in order that the images may be seen through one of the three frames on the front of the demonstration unit. In addition to the television material made by Daven, this concern also specializes in resistors, both of the processed glass type and the wire wound type, the latter being suitable for plate circuits of power tubes in resistance coupled amplifiers.

We have been recently informed by Mr. Jenkins of Washington that for the benefit of the novice there is available a very inexpensive kit suitable for securing small images which may later be magnified by means of a suitable glass up to 3 inches square. This small kit which has been made available to the experimenters only costs \$2.50 and is sufficient to give a beginner a start in the right direction towards receiving pictures from 3XX or other broadcast stations. The device consists of a mounting for the 12 inch disc, a flange for driving the scanning disc after the method shown in Fig. 6, page 86, of the September issue of this magazine. While the images secured with this small outfit are not very large, nevertheless they may be magnified with a suitable reading glass. Any further information on this score may be secured by writing Mr. Jenkins at 1519 Connecticut Avenue, Washington, D. C.

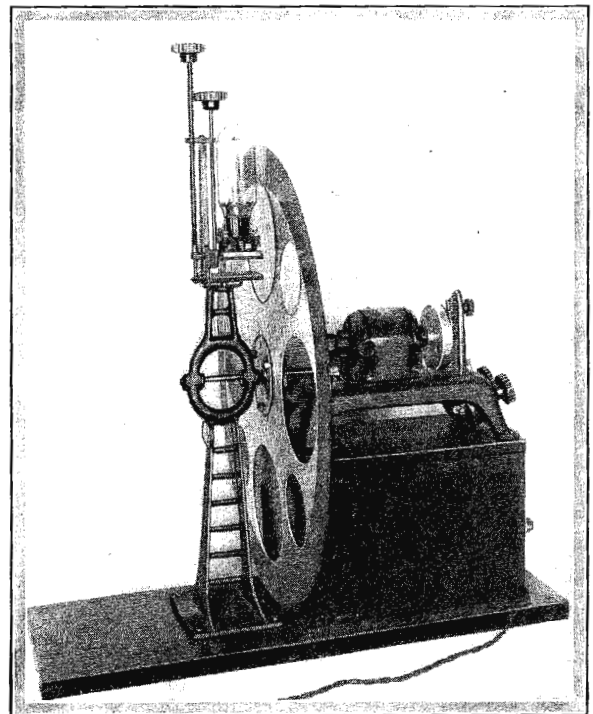


Fig. 22. This photograph is of the recently announced automatic scanning disc control made by Clarostat for which constant speed with speed correction at every fraction of a revolution is claimed by the manufacturer

Multiplicity of Uses Found for 731 "Round the World" Adapter

Compact and Shielded Unit May Be Used for Television, S. W.
Time Signals and Broadcasts

DESIGNED originally for a short wave adapter which might be plugged into any existing radio receiver and give the listener the full play of the broadcasts being transmitted on high frequencies, the Silver-Marshall 731 "Round the World" adapter has two other interesting uses, which at the present time are quite prominent. The first is for the reception of television signals broadcast on wavelengths below 200 meters and the second as a means of picking up time signals from the United States and abroad on short waves. The last use for the 731 adapter should prove of more than passing interest to the small town jeweler located in any part of the country, who may wish to set his chronometer daily by the "time tick" from Arlington at Washington, D. C., WNBZ of the Elgin Watch Co. or from Chelmsford, England, or the Eiffel Tower at Paris.

Used on Jenkins

The receiver has recently been tested on one of the television reception outfits maintained by this magazine and for many nights the signals from 3XX at Washington, D. C. from the Jenkins transmission were picked up on the 731 adapter and fed into a special amplifier before being impressed upon the neon tube. The receiver has an extraordinarily good kick and the tuning is simplicity itself. The circuit is a regenerative one in the detector stage, with a screen grid tube in the radio frequency end arranged so that the tube acts partly as an amplifier and partly as a buffer stage to prevent oscillating energy from the detector reaching the antenna.

Receiver Quite Simple

An inspection of the schematic circuit shown in Figure 2 discloses the simplicity of the receiver itself. The antenna is led directly to the cap of the 222 tube and one end of the 277 radio frequency choke, the other end of which is grounded. The plate circuit of the 222 tube has in series with it an inductance, which in the normal receiver would be considered the secondary. An r. f. choke No. 275 is placed between the bottom end of this secondary and the 135 volt terminal of the battery, the choke being properly bypassed with a .005 mfd fixed condenser to ground. The tuning is around the inductance in the plate circuit of the 222 by means of a .00014 mfd variable condenser and the energy therefrom is fed into the grid circuit of the detector tube through the .00015 mfd grid condenser, with a 5 megohm grid leak from the grid of the tube to the negative filament. Regeneration is by means of the regenerative coil wound in a slot at the bottom of the plug-in inductance and is controlled by the .00035 mfd variable condenser shown at the right of the diagram in Figure 2. The radio frequency choke No. 277 is placed in series with the regenerative coil, or plate coil, and leads to the P terminal on the resistance amplifier if used for television, or to the primary of an

audio amplifier if used otherwise.

The filament of the 222 tube has a 10 ohm fixed resistance in the negative leg to ground, which resistance furnishes the necessary bias for the grid of the tube. Another 10 ohm resistance in series with the positive leg suffices to bring down the 6 volts of A battery to the proper value for the operation of the particular tube. The screen grid of the 222 is bypassed at the socket with a $\frac{1}{4}$ mfd condenser and is supplied with a potential varying from 22 to 90 volts, depending on whichever the operator finds the most satisfactory for strongest signals and easiest operation of the set.

Coil Fits on Top

Figure 3 shows a view of the front of the cabinet with the two National tuning dials and the filament switch and rheostat. On the top of the cabinet is shown a five-prong socket, into which fits the particular short wave coil desired by the operator. In practice it has been found that an experienced builder can put this kit together in an hour, although the novice may consume two or three hours to get it all assembled and properly wired. The job should be wired with flexible wire, since that is the easiest to run inside of the shield. In view of the fact that aluminum is used for housing, the receiver is singularly quiet in operation and the signal strength drops off to nothing when the antenna is removed from the set.

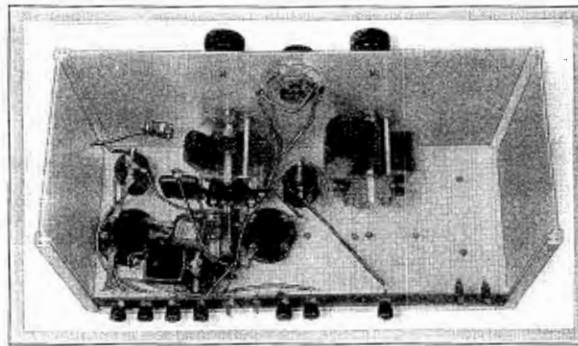


Fig. 1. This photograph shows the Silver-Marshall 731 adapter, which is photographed upside down, since all the parts are placed on the inside top of the shield. The coil socket is located on the top as is shown in Fig. 3

Range of Wavelengths

The ranges of wavelengths covered by the four short wave coils and the two broadcast band coils are as follows:

- 131-T—17.4 to 32 meters
- 131-U—31 to 58 meters
- 131-V—56 to 110 meters
- 131-W—105 to 204 meters

The above coils comprise those furnished with the 731 adapter kit. In addition there are two other coils by means of which the listener may span the American broadcast band with ranges as follows:

- 131-X—190 to 360 meters
- 131-Y—345 to 650 meters

It should be borne in mind by the listener that the X and Y coils are not intended to be ultra-selective. The principal reason for their design is the fact that in many cases the operator wishes to listen to television broadcasts, which at this time are being sent on the longer waves, and this particular set of coils will enable the listener to satisfy his ambitions along that line. For example, WCFL and WIBO transmit television on their regular broadcast channel. The four short wave coils are extremely sharp and on these bands several of the television transmitters are now

(This receiver tested and all illustrations made in our laboratory)

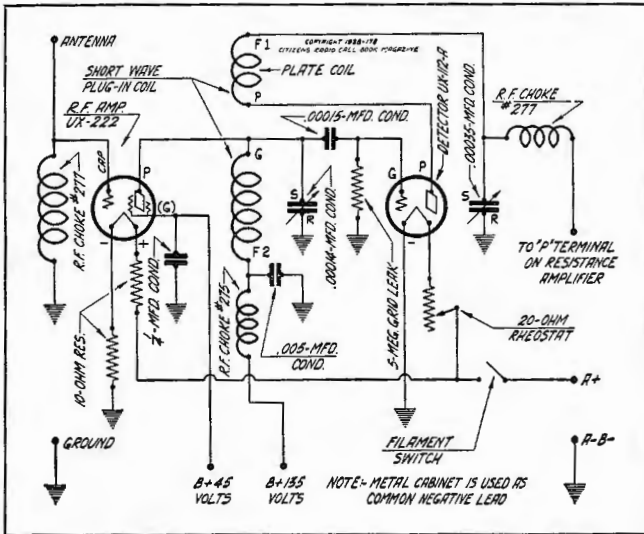


Fig. 2. The schematic utilized in the 731 adapter, for which many uses are found, is shown above. On account of the aluminum shielding being used, many of the connections are dispensed with and the aluminum forms the negative return and ground

located. With the six coils any operator is in position to go from the highest to the lowest wavelengths used for broadcasting purposes with very satisfactory results.

Although this short wave adapter may be operated from a B eliminator, nevertheless if head phones are being used, it is advisable to stick to dry B batteries in order to cut down the noise level to a point where the listener may enjoy reception without listening to 60 cycle hum. The current drain of the receiver is exceedingly small and a set of heavy duty B batteries should almost last for their shelf life on this kit. Where a B eliminator is used, it is suggested that extra bypass capacities be used across the 45 and 135 volt terminals, as well as across the voltage terminal supplying plate current for the detector. The antenna may consist of a single, properly insulated wire, strung up either indoors or outdoors and from 20 to 100 feet long, depending on results obtained. Make the ground connection to a well scraped water pipe.

How to Tune Set

After the batteries are hooked up and the set is put into operation, insert the 131-V coil, the one with the greatest number of enameled wire turns, in the socket at the top of the cabinet and

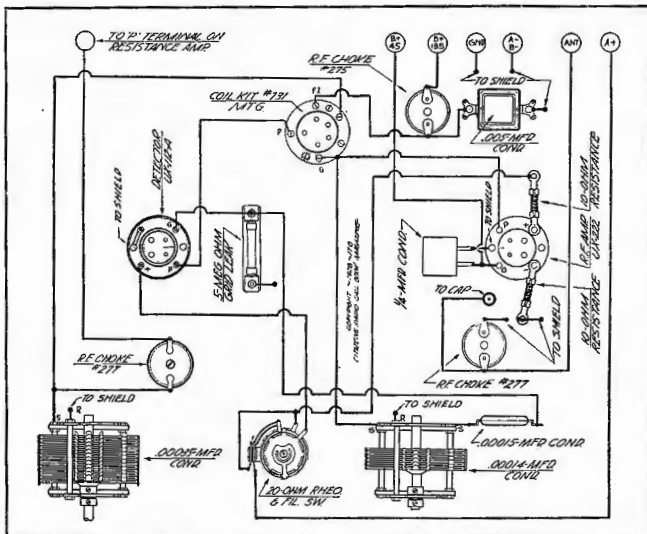


Fig. 4. This diagram shown here does not represent the manner in which the apparatus is placed in the aluminum shielding, but is only given for simplicity in wiring on the part of someone who is not accustomed to set construction

turn the center knob so that the arrow points straight up. An examination of the tuning curve, which is supplied with the kit, will show that KDKA (64 meters) will be found at 20 to 25 on the left dial. Turn the right dial up from zero until a plunk is heard in the head phones or speaker and then rotate the left dial about its setting until a sharp squeal is heard. If this squeal is broken up into dots and dashes, a code station is being tuned in and this may be intensified by carefully adjusting both dials and the small knob. Continue to adjust the left dial, with the right dial turned up above the point at which the plunk is heard, until a continuous sharp squeal indicating a telephone or broadcast station is heard. Adjust the left dial to obtain lowest pitch of squeal and turn the right dial down until the squeal just disappears and the program is heard. The adjustment of both dials for best tuning will be found quite critical and to facilitate tuning the dial reduction gear ratios may be increased by tuning to the right the small nickel buttons just above the tuning dial knobs, which will cause the indicator dials to revolve very slowly for a given knob movement. Volume may be reduced by turning down the right dial. To tune in other stations, adjust the dial as above, plugging in the proper coil for station wavelength desired and varying the left dial about setting at which desired wavelength should be heard, as indicated by the chart previously referred to. The chart is only approximate and after stations are heard, accurate setting of tuning curves should be made by correcting the original curves. Although at the time there are not many broad-

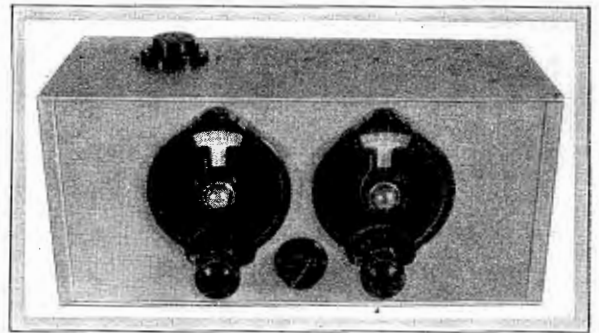


Fig. 3. This photograph shows the front of the short wave adapter, the left dial being for wave length control and the right for regeneration. The knob at the center is for the 20 ohm rheostat in series with the filament of the detector tube, while the socket located on top of the can is used for holding the short wave plug-in coils

cast stations working on short waves, nevertheless WGY, WLW, KDKA, WRNY, 2XE and a few others are now broadcasting programs which should be of interest to any listener, particularly in view of the fact that with a short wave set it is possible to pick up programs as they are broadcast at high noon when the same programs would be totally inaudible on the longer wavelengths. While there is some tendency towards skip distance or fading on the short waves, nevertheless that phenomena is not bad enough to prevent pleasant reception from short wave broadcast stations and many an evening may be spent in listening in after this fashion.

If the owner of a standard receiver desires, he may use the 731 adapter kit as a means of plugging into the detector stage of his regular set and picking up short wave broadcasts, the amplification at audio frequencies being supplied by the audio amplifier in his regular set. In that case, the terminal marked "P terminal on resistance amplifier" should go to the plate terminal of the detector socket after the detector tube has been removed. The tuning of the receiver under these conditions is identical as previously explained, and the tuning of the regular receiver is not molested, since it is not functioning when the adapter is plugged into the detector socket of the standard receiver.

Parts required for the construction of the adapter are as follows:

- 1 Silver-Marshall 734 aluminum shielding cabinet with terminal strip

(Continued on page 144)

Special Tuned Grid, Tuned Plate High Frequency Television Tuner

Recent Tests on Extreme Distance Show Necessity for Exceedingly Sensitive S. W. Receiver

DURING the course of our experimental reception work on short wave television signals from 3XK at Washington, it soon became evident that when the signal audibility dropped below a certain point it was imperative that to maintain fairly consistent modulation of the television lamp in the receiver it was necessary to have a short wave tuner which would go down to the noise level and bring in every bit of energy that it was possible to secure.

While many of the conventional short wave tuners have been eminently satisfactory for this purpose and received signals with very creditable strength over average distances, nevertheless it was felt for those who are experimentally inclined that more energy should be available than was being secured.

Tuning Input and Output

Consequently it was decided that the screen grid tube offered an excellent opportunity of tuning the input and output of the 222 tube, preferably by a tandem condenser arrangement so as to simplify the operation of the receivers in the hands of a man who had already been busy trying to maintain synchronism of the scanning mechanism.

In the design illustrated in Fig. 1 and schematically in Fig. 4, the technicians of this magazine felt that there would be a real advantage in double tuning of the screen grid tube. Accordingly, an experimental set-up was made in accordance with the schematic diagram shown in Fig. 4, and after repeated tests on television signals from 3XK the design was pronounced a success.

The job was then taken from its "bread board" form of construction and placed on a sub-panel, as illustrated in Fig. 1. The bottom of the sub-panel is shown pictorially by means of the photograph in Fig. 2, which also gives the builder an idea of the simplicity of the parts arrangement, as well as the wiring.

An inspection of the photograph in Fig. 1 will disclose the fact that two single condensers are tuned with a single shaft, electrical isolation between the two circuits being accomplished by means of a Hammarlund flexible insulating coupling. This is an important part of the design in that the two rotors may not be common, as such a procedure would short circuit the 135 volt terminal of the battery.

Two Identical Inductances

Referring now to the schematic circuit, which gives the electrical details of the recent design, it will be seen that two identical sets of inductances of the plug-in type are employed. The first inductance, whose regenerative winding is not used, is located in the input circuit of the 222 tube between the cap and the negative filament and is tuned by the front single .00014 mfd variable condenser, this condenser having been located at the

front of the sub-panel because this circuit is not as critical as the plate circuit, as will be shown later. The bias for the grid of the 222 tube is secured through the drop across a 10 ohm fixed resistance in series with the negative leg of the screen grid tube.

In the plate circuit of the screen grid tube a second inductance, identical with the first one, is located, this being tuned by the rear individual .00014 mfd variable condenser, a 275 radio frequency choke being placed at the lower end of this winding and bypassed by means of a .005 mfd bypass condenser. The regenerative winding of this second inductance of the plug-in type, which is wound in a slot at the base of the coil, is located in the plate circuit of the detector and tuned capacitatively for regeneration or oscillation by means of a .00025 mfd variable condenser located between the junction of the regenerative coil and the r. f. choke and the negative filament line. Detection in the detector is by means of the .00025 mfd fixed grid condenser spanned by a 1 megohm grid leak.

The screen grid is properly bypassed with a 1 mfd condenser at the socket and has between it and the B-45 source of potential a 277 radio frequency choke.

Inasmuch as the plate circuit of the 222, which corresponds to the input circuit of the detector, is highly critical when used in a regenerative or oscillating condition, it was found best to have the variable condenser covering this inductance located the farthest from the operator, and for that reason it is placed at the rear of the sub-panel, while the variable condenser spanning the grid input circuit of the 222 tube is located closest to the panel because this particular circuit is not as touchy as the previously mentioned regenerative circuit.

Varying Antenna Load

In order to insure almost exact tracking of the input and output circuit of the 222 tube, a .00005 mfd midget condenser is located at the rear of the sub-panel and in series with the antenna binding post. By proper manipulation of the midget condenser, it is possible to arrange the receiver so that on any given signal with a certain antenna length the two tuning stages will track as close as possible. Of course, for wide changes in wavelength, that is, jumping from a low band to a high band, it will be necessary to readjust the antenna midget condenser so as to shift the antenna load and permit absolute resonance between the grid and plate tuned stages. However, for most of the short wave reception, the midget condenser is three-quarters of the way in, while when the receiver is tuned to the lower wavelength of the broadcast band, it may become necessary to decrease the amount of capacity used in the antenna circuit.

Regeneration control of the receiver is by means of the single .00025 mfd variable condenser at the right of the operator when

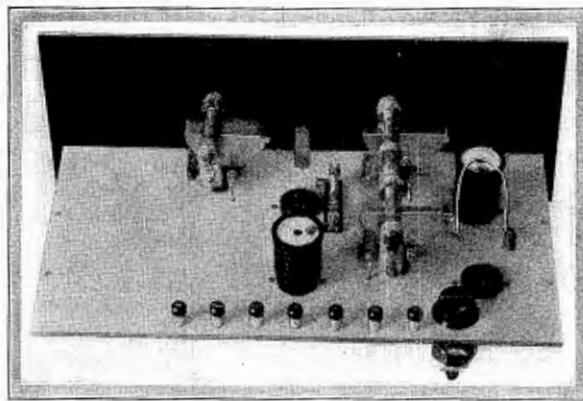


Fig. 1. This photograph shows the rear panel view of the tuned grid, tuned plate tuner described herein. Note the symmetrical arrangement of all parts

(This receiver designed, tested and all illustrations made in our laboratory)

facing the panel. This control is very smooth and positive and when the vernier ratio on the dial is adjusted for slowest movement, extremely fine shading of regeneration may be accomplished. Instead, the detector will slip into oscillation with a very gentle hiss and may be brought out of such oscillating condition by a very slow movement of the dial. This is quite desirable on weak signals and especially so when attempting to get the maximum out of a given broadcast signal.

Critical Screen Voltage

In the case of reception of 3XX, on which this receiver is now being used, the signals are very clean-cut and have an extremely good signal response. The screen grid voltage is somewhat more critical on the short waves than on the long, and for the operator using coils T, U, V and W, it is quite likely that a screen grid voltage of 45 to 67 volts will be ample and will give good control. However, when using the two broadcast coils, that is, the X and Y series, it becomes necessary to reduce the screen grid voltage to 22 volts, in order to maintain the receiver in a stable condition.

The special X and Y coils made by the Silver-Marshall interests were designed in response to certain requirements of our experimental television work, where it was desired to occasionally go up on the broadcast band with the television receiver, and it was felt that the transition from the low waves to the long waves would be too cumbersome if it involved the use of two separate receivers. Accordingly, these coils were designed by Silver-Marshall to allow the bridging of the broadcast band. It is not anticipated that these coils will be used for any work other than experimental, because they do not give the same degree of sharpness on the broadcast band as the T, U, V and W series does on the lower band. This is especially true in congested locations, although occasion can arise in a remote section where the X and Y coils would suffice for good broadcast reception.

In addition to the television reception possible with this tuner, there is also the angle of short wave broadcast of an entertainment nature, such as KDKA, WGY, WLW, etc., and an added feature of being able to pick up time signals from foreign broadcast stations on short waves. To those who have served their apprenticeship years ago in the radio game, there is quite a kick in hearing again on short waves the plaintive notes from FL denoting the French time tick.

This receiver design bears out somewhat the statement made

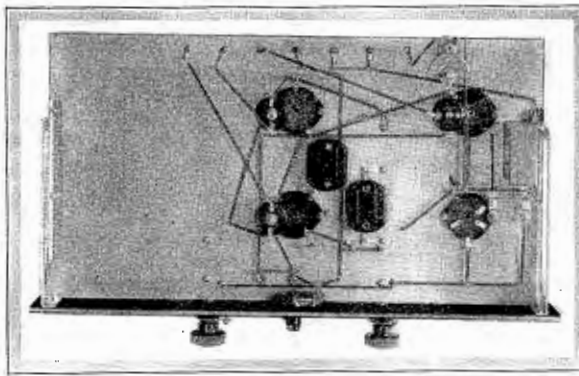


Fig. 2. In this photograph the under side of the sub-panel is shown to give an idea of the simplicity of parts location and wiring

in the March, 1928, issue of this magazine, where a similar tuning arrangement was employed in the Citizens Shield Grid Short Wave Receiver, although this particular model was shielded. Since then experiments have shown that if the design is carried out as shown in this article, even better results may be obtained by the operator than with the previous model.

Official Parts List

Parts required for the construction of this receiver are shown in the accompanying list:

- 2 ML Hammarlund .00014 mfd variable condensers
- 1 Sangamo .00025 mfd fixed condenser
- 1 Sangamo .005 mfd fixed condenser
- 1 400 Acme Parvot 1 mfd bypass condenser
- 1 ML17 Hammarlund .00035 mfd variable condenser
- 1 Hammarlund .00005 mfd midget condenser
- 2 277 Silver-Marshall radio frequency chokes
- 1 275 Silver-Marshall radio frequency choke
- 2 131-T Silver-Marshall short wave coils
- 2 131-U Silver-Marshall short wave coils
- 2 131-V Silver-Marshall short wave coils
- 2 131-W Silver-Marshall short wave coils
- 2 131-X Silver-Marshall short wave coils
- 2 131-Y Silver-Marshall short wave coils
- 2 Yaxley 10 ohm fixed resistances
- 1 Yaxley 4 ohm fixed resistance
- 1 Durham 1 megohm grid leak
- 1 Electrad grid leak mounting
- 1 Formica 7x18x¹/₈ inch black front panel
- 1 Formica 9x17x¹/₈ inch ivory sub-panel
- 7 XL bakelite binding posts
- 2 Eby UX sockets
- 2 Eby UY sockets
- 2 B National vernier dials
- 1 10 Yaxley line switch
- 2 8629 Benjamin brackets
- 1 Hammarlund flexible coupling
- 1 Package Kester radio solder
- 1 Ceco or Sonatron 222 screen grid tube
- 1 Ceco or Sonatron 201-A tube

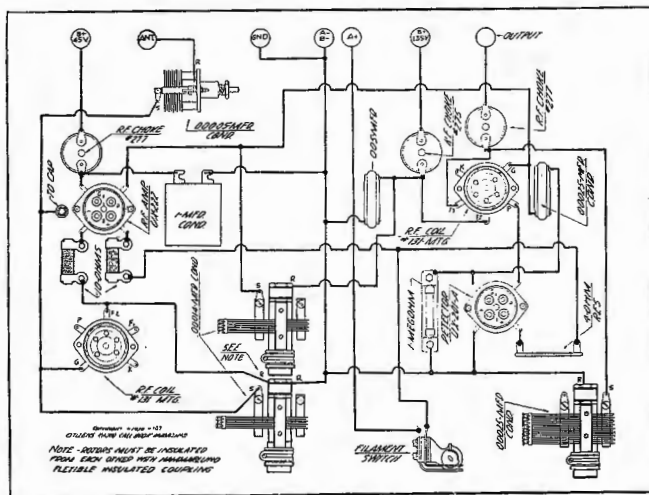


Fig. 3. This diagram is of the graphic type and enables the novice to accurately construct and wire up the receiver described in this article

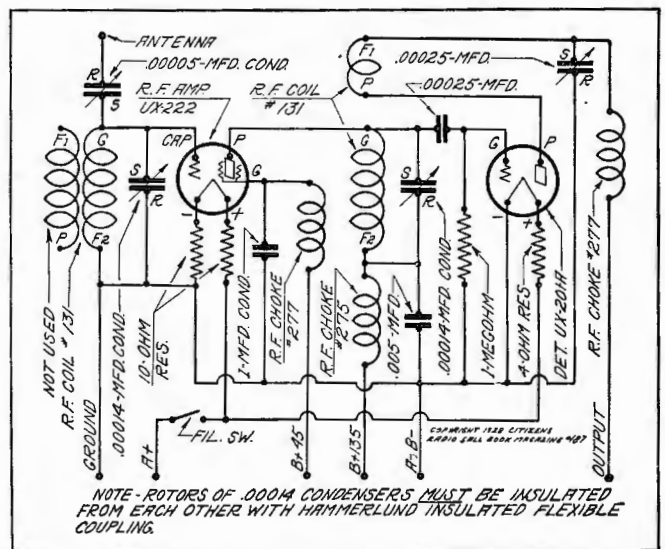


Fig. 4. The schematic circuit shown above gives all the necessary details for the construction of the extremely sensitive receiver for distant television signals



With the PROFESSIONAL SET BUILDER

MANY professional set builders who replied to our questionnaire printed on page 165 of the March, 1928, issue of this magazine failed to give in their replies the name of their city and, as a consequence, this publication could not forward them the letter of thanks for the information which was contained in those questionnaires.

The set builders shown in the following list furnished us with good information on the questionnaire, but neglected to give the name of their city:

Chas. H. Longden, Albert F. Pinson, J. L. Mauldin, Jr., H. P. Kinneke, Zeph Willison, N. C. Schultz, Henry B. Bell, John D. Keith, C. L. Quick, H. F. Papenfuss Co., A. C. Ely, F. B. Wheeler, Edw. Burke, Harold V. Parkhill, Gene Smith, Wilson Ayers, G. M. O'Connell, Carl Wickstrom, John G. Cooney, John A. C. Callan, Melvin E. Lindner, J. H. Rappold, Edward W. Little, E. S. Brown, E. M. Cook, D. M. Holt, Wm. R. Wolfenbarger, Wilfred T. Harris, I. E. Snyder, Esley E. Bevan, ORVO Radio Shop, J. C. Cardin, Albert F. Trotter, Tom Harrington, Burnet H. Henyon.

Using Truvolt Divider

THERE are many occasions when a professional set builder can save considerable time in the construction of a power supply by the employment of a voltage divider such as the one made by Electrad and illustrated graphically in Fig. 2, where it is used as the resistance unit in an AmerTran power amplifier and plate supply system. This Truvolt divider has within the metallic housing three variable resistors covering plate voltages and two variable resistors for C bias purposes. Connections are brought out to terminals on the unit, which may be rapidly and easily wired into any power amplifier. The unit may be mounted vertically or horizontally, as desired. The only external resistor required for operation is the B 250 Truvolt used to drop the voltage from the high voltage output of audio choke 854 to such a value as to be used on the Truvolt divider since the divider has been designed for potentials not to exceed 220 volts. The manual which accompanies the Truvolt divider gives the necessary data for determining the value of the fixed resistor in accordance with the different current drains of the systems in use. Page 6 of the manual and page 13 give ample information for any professional set builder to readily determine what fixed resistance value he requires.

New Test Bench

SERVICING a radio set has ceased to be a haphazard process. The use of electrical instruments has removed the mystery from radio trouble finding. Jewell Pattern No. 580 radio test bench shown in Fig. 1 is the latest development in a complete test instrument containing everything necessary to completely check the circuit and general working condition of any radio receiving set or accessory. It is a most indispensable piece of equipment for the radio jobber, dealer, service station or small laboratory.

Its general characteristics are as follows:

The bench proper is substantially made of hard maple with a top of generous size, 24x42 inches. The working surface is 36 inches high. A tool drawer is included. The testing panel is steel, black enameled, with all markings engraved directly in the steel and filled with white. The panel carries seven instruments, as follows: 0-7.5 volts d. c., 0-75 volts d. c., 0-150-300-750 volts d. c., 800 ohms per volt, 0-15-150 d. c. milliamperes, 0-4-8-16 volts a. c., 0-150-750 volts a. c. and 0-1.5-15 volts a. c.

The panel is supplied with binding posts, so that all instruments can be used individually and with switches to cover all ranges. It is also supplied with a plug and cord so that all circuits in a radio set can be tested along with the tube, which may be placed in a socket in the panel. A pair of outlets is arranged to be connected to the 110 volt, 60 cycle, a. c. line, so that line voltage is also used for measuring.

This Jewell radio test bench is a well made, carefully designed and practical piece of equipment which jobbers, dealers or professional set builders who have a large quantity of servicing to do will find very efficient as a part of their testing equipment. Large, precision type instruments with long scales can be read to a high degree of accuracy. Readings are simultaneous and independent of each other.

Handy Unit for Bench

A RECENT suggestion made by O. H. Schmidt, 5601 South Kolin Avenue, Chicago, Ill., is shown schematically in Fig. 3. Any man handy with tools can readily make up such a unit which comprises two tip jacks, two 110 volt flush receptacles, one open circuit jack and a cable plug, all of which units are mounted on a small oblong strip of bakelite and placed over the work bench. As will be seen in the schematic circuit, an antenna may go to one of the tip jacks and the ground to another. The 110 volt a. c. switch shown in the diagram throws on and off soldering iron, power supply or eliminator and a light

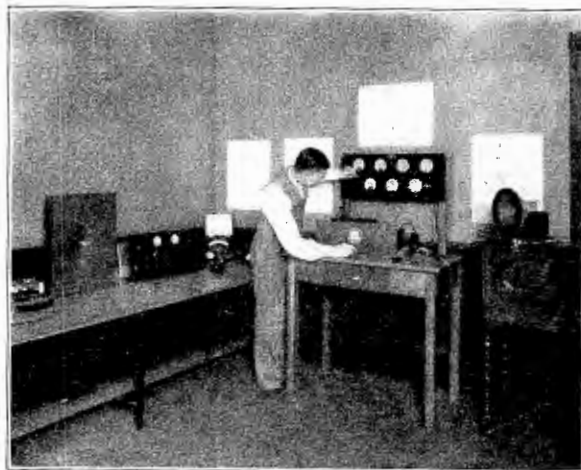


Fig. 1. This photograph shows a professional set builder making use of the Jewell 580 radio test bench described in this department

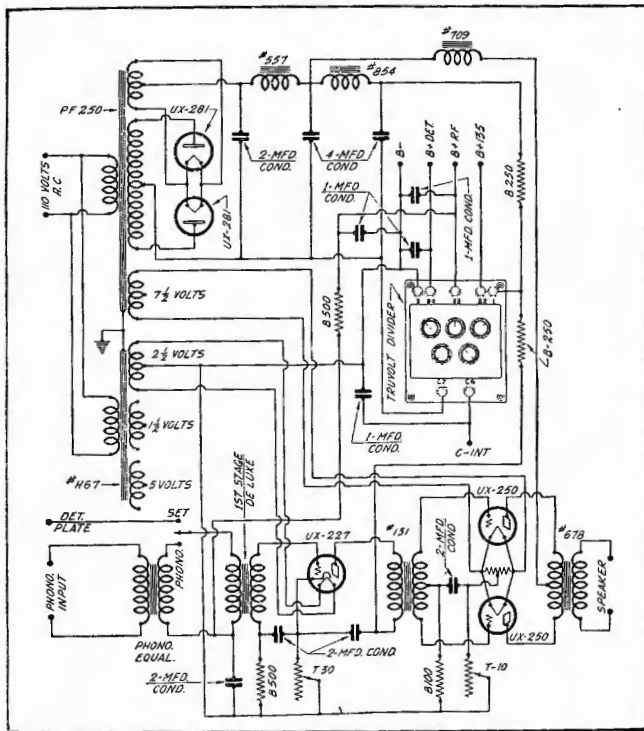


Fig. 2. This schematic circuit is given for the benefit of professional set builders who wish to see how to include in an AmerTran power supply a TruVOLT divider which comprises all the necessary resistances in a compact unit. The divider is shown in graphic form in the schematic above

over the work bench. Thus the fact that the light is on shows that the circuit is alive and the turning off of the light by means of the switch shown prevents the soldering iron or eliminator remaining on over night.

By means of a plug and the jack combination shown at the bottom of the schematic any receiver output may be run through a standard power amplifier for test purposes. The cable plug shown at the upper right of this diagram connects to the B eliminator or power supply and the A supply.

At the time of going to press we had not been able to secure a photograph of this simple device, but one will be obtained and will appear in the next issue of our magazine containing this department.

Disappointed in Show

BEN B. SKEETE, 348 Halsey Street, Brooklyn, N. Y., writes to advise that as a professional set builder he was very much disappointed in the recent New York Radio Show because everything was encased in furniture and the professional set builder did not have an opportunity of inspecting the chassis for arrangement of parts, wiring and workmanship. He suggests that kit manufacturers have a fair or exhibition of their own, with awards for the best parts and a grand prize for the best kit embodying selectivity and sensitivity and fidelity of tone, together with the mechanical layout.

High Volume Theater Amplifier

WIDER and wider grows the field of usefulness of the new high-voltage power tubes; the time is almost at hand when no theater or dance hall can afford to be without an amplifier capable of filling the hall with undistorted volume sufficient to fill the hall, and taking its input either from a magnetic phonograph pickup or from a radio detector tube—receiving on either broadcast or short-wave bands. It is possible to build such an amplifier, with parts now available, at a very moderate cost; the

one here described provides ultra-fine reproduction of electrically-cut records, with greater volume and finer tone than any other two-stage amplifier so far tested. Numerous speaker manufacturers have concurred in this view, and the amplifier is being employed by various electrical phonograph manufacturers for use in home and theater.

Besides the two amplifying tubes (226 and 250 type), one 281 type rectifier tube is required. Any dynamic speaker with field coil wound for 90 to 110 volts d. c. can be used. The amplifier circuit, seen in the diagram, is designed to supply this excitation current, at the same time using the field coil as a choke. Thus, the current path leads from the rectifier tube filament direct to the speaker field, with the usual 2 mfd capacity to bypass nearly all the 60 cycle pulsations. What little of this "hum current" enters the field coil does no harm; it is, however, bypassed off to ground, through a 4 mfd capacity, before reaching the right post of the "To Speaker" pair. At this post the required 450 volt potential is delivered to the plate of the 250 type tube. To it is connected, instead of the ordinary voltage divider, simply a 60,000 ohm resistor which serves to reduce the high plate voltage to approximately 135 volts for the 226 type tube. The other four 1 mfd capacity units in the condenser bank are employed to bypass the bias resistors, 2,000 and 1,500 ohms respectively, of the 266 and 250 type tubes.

The use of three input binding posts is necessary because of the unique internal circuit of the Clough system audio transformers. Only the two marked "pickup" are required for phonograph amplification, but all three are necessary for connection to a radio receiver, as explained on the diagram.

Whether the input comes from radio or from a record, the undistorted output available, whenever required, reaches the tremendous figure of almost 5,000 milliwatts. The most exact reproduction of the original tone quality can be relied upon, owing to the action of the Clough system audio transformers, in amplifying, with an almost exact straight-line characteristic, all frequencies down to about 50 cycles, and up to the highest pitches perceptible to the ear. The other well-known feature of the Clough design—the absence of hysteretic distortion—is particularly valuable in an amplifier designed to work at high volume.

The amplifier can be built quite easily, into the neat crackle-finish case specified, which is 3 3/8 inches wide, 5 1/4 inches high and 17 inches long. A small panel at one end carries all binding posts, and the tubes project, for good heat radiation, from the top of the case. Power is taken from any 110 volt, 50-60 cycle a. c. mains. A second dynamic speaker can be added if necessary for theater or dance hall coverage.

Parts Needed

- The following parts are required:
 1 S-M 678 case, chassis and panel

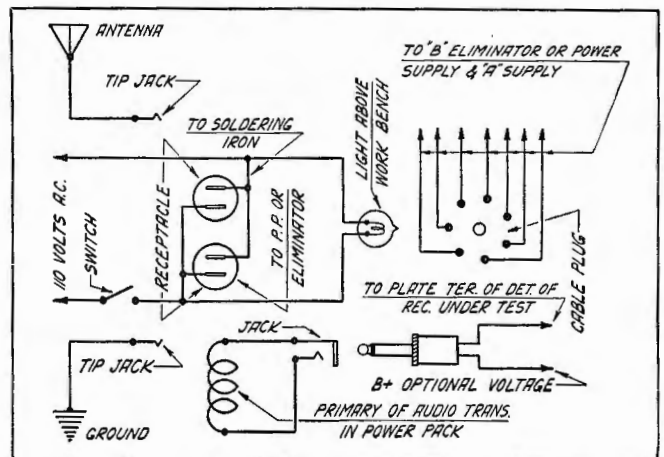


Fig. 3. The sketch shown above is sent in by one of our professional set builders who uses such a method on his work bench

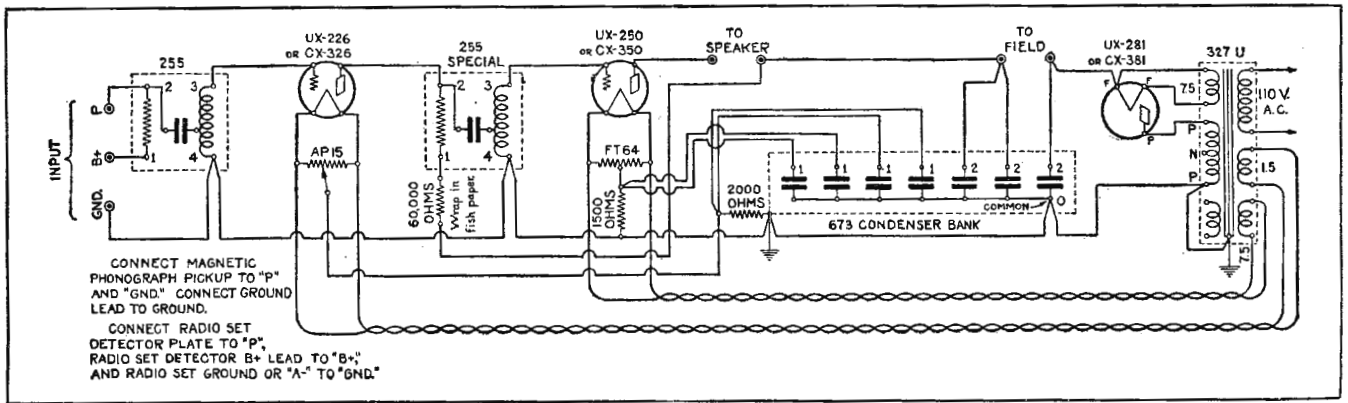


Fig. 4. The schematic circuit of the two stage amplifier is shown above. It supplies field current to the coils of the dynamic speaker of the type requiring 90 to 110 volts for excitation, at the same time using them as chokes in the plate circuit of the 250 power tube. Properly utilized in a circuit design this reduces considerably the cost of high grade power amplification

- 12 Binding posts
- 12 Soldering lugs
- 1 Yaxley 5,000 ohm manufacturer's type potentiometer
- 1 S-M 327U transformer
- 1 S-M 255 transformer
- 1 S-M 255 special transformer
- 1 Potter 673 condenser bank
- 3 S-M 511 sockets
- 1 Ohmite 1,500 ohm resistor
- 1 Yaxley 840C balancing resistor
- 1 Yaxley 2,000 ohm resistor
- 1 Durham 60,000 ohm, 1 watt resistor
- 1 Carter AP15 potentiometer
- 6 Feet No. 18 black twisted lamp cord
- 1 Detachable plug
- 15 Feet S-M hook-up wire
- 1 Set hardware as follows:
 - 1 2 1/2 x 8/32 inch R. H. machine screw
 - 2 2 3/4 x 8/32 inch threaded brass rods
 - 5 8/32 hex. nuts
 - 2 Brackets
 - 2 Insulating washers, flat
 - 1 Steel strip 6 1/4 x 3/8 x 1/16 inch 6 holes, 4 countersunk)
 - 14 6/32 x 3/8 inch machine screws

- 18 6/32 hex. nuts
- 18 Shakeproof lock washers
- 8 4/36 x 3/16 inch R. H. machine screws
- 1 Panel angle
- 4 4/36 hex. nuts
- 1 Piece fish paper 2x3 inch

IN keeping with our policy of giving in the Professional Set Builder's Department information which will be of profitable service to custom builders of radio sets, we are in this issue giving some of the salient features of the policy observed by Silver-Marshall, Inc., in their personal contact with professional set builders.

One of our representatives recently called on the firm of Silver-Marshall, Inc., to get an idea of the scope of their activities in co-operating with custom set builders and service stations. It is surprising to know the amount of time, money and energy spent by this organization in contacting, informing and helping the many who find it profitable to build receivers with S-M merchandise.

Recently Silver-Marshall made a survey of the custom building field, so as to be in position to give these set builders all of the latest data concerning their merchandise and the possibilities of its sale in built-to-order form.

In every package sent out from the factory there is a card enclosed which the recipient is requested to fill out. This card has on it space wherein the recipient designates whether he is merely a radio set owner, whether he is only a fan, whether he is an amateur, or whether he is a professional set builder devoting either full or part time to this work. There is still another space allowed for designation as a radio dealer.

Since this department is only concerned with professional set builders, we will give attention only to this particular subject with respect to the card which is enclosed in every package of S-M merchandise. Assuming that a customer has signified his occupation as a professional set builder, he is forwarded a copy of "The Radiobuilder," a little house organ issued by Silver-Marshall. He is also told that there is a possibility of his becoming an authorized service station and if he cares to consider this proposition he is invited to fill out a questionnaire, giving the firm data as to his qualifications for this work. This questionnaire acts somewhat as an examination paper to determine the ability of the individual to service sets and to handle the line of merchandise.

After this questionnaire has been received by the firm, one of the representatives of the firm calls on the professional set builder who wishes to be appointed an official service station and makes a report on this individual covering personal appearance, sales ability, technical radio ability, apparent financial condition, chance of his making a success as a custom builder, what sort of lab-

(Continued on page 136)

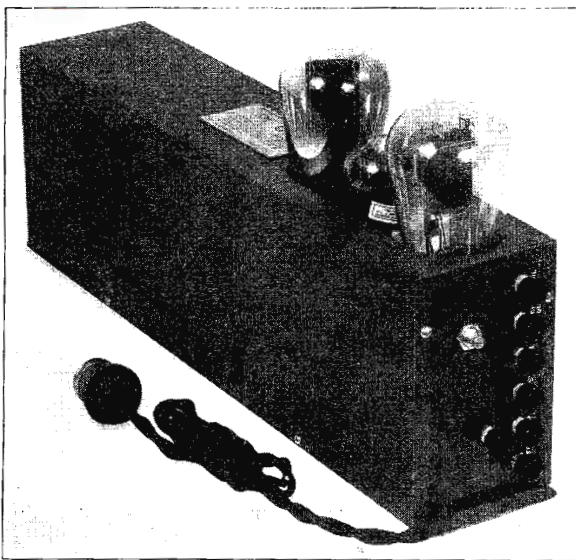


Fig. 5. A new two stage amplifier for the 250 tube, readily built from standard Silver-Marshall parts is desired, gives unexcelled tone quality with low cost, simplicity and compactness

Receiver or Speaker Comparator May Be Help in Your Test Work

Simple Arrangement of Switches and Plugs All That Is Needed to Make Useful Device

ON many occasions the professional set builder wishes to make a comparison between one receiver and another or else between two speakers on a given receiver or electric phonograph amplifier. Ordinarily this would be somewhat of a job, inasmuch as quite a number of connections would have to be shifted in order to make the comparison.

However, recently our laboratory technicians have found a simple method of comparing two receivers or speakers by means of the simple device illustrated on this page.

Is Simple Device

The schematic circuit shown in Fig. 1 shows that the unit consists of twelve Frost pin jacks used in conjunction with the six point General Radio switch, the various speakers being placed across the pairs of tip jacks, which may be seen in the photograph shown in Fig. 2. The switch transfers the output of set No. 1 or set No. 2 onto whichever one of the six pairs of tip jacks the operator desires. The four pin jacks underneath the double pole double throw switch shown in Fig. 2 are those of the outputs of set No. 1 or No. 2.

At the right of the panel in Fig. 2 are the two single pole single throw switches and their associated binding posts, in the event that dynamic speakers are being used. This particular series of connections allows energizing the speaker field, regardless of whether it is a 6 volt battery, 110 d. c. or the 110 a. c. rectified supply.

In the event that the regular magnetic speakers are being used, they are placed across the speaker positions illustrated in

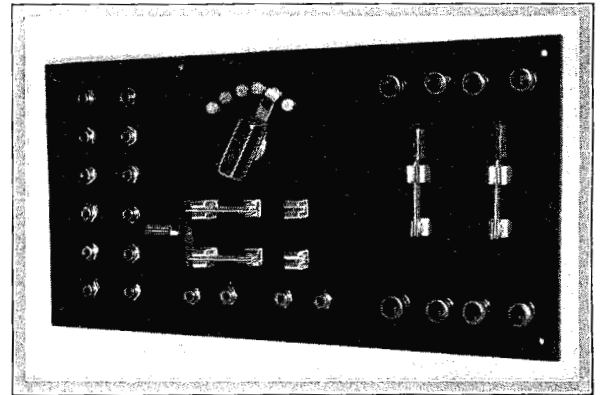


Fig. 2. This photograph shows a front view of the comparator after it has been put together. All wiring is in the rear of the panel. The panel may be either placed up against the wall, put into a box, or held in an upright position by means of small metal legs

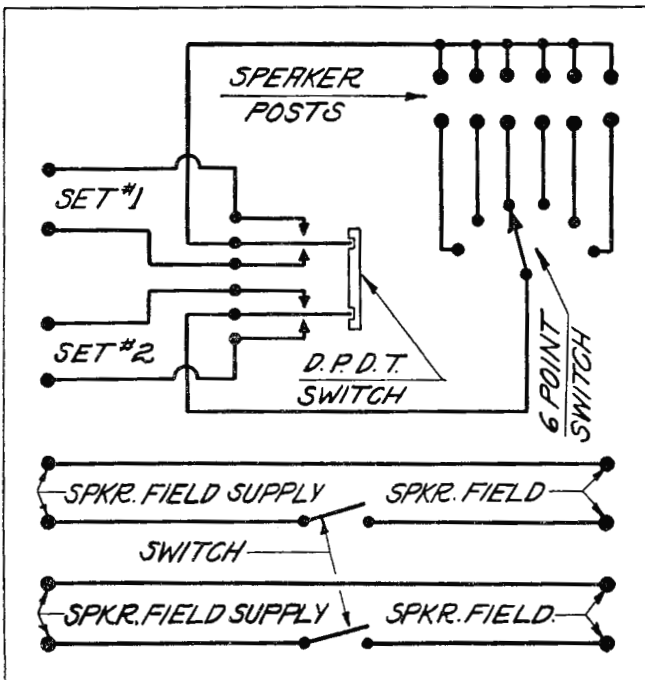


Fig. 1. The schematic circuit outlined above is one that is used in the comparator and to a professional set builder it is self-explanatory

the schematic without further changes, since these speakers do not have field windings.

This device may be mounted in several fashions in accordance with the desires of the service man. As a rule it will be found most satisfactory to mount it by means of four tubular legs, through which long screws affix it to the wall at the end of the test bench. Another method would permit its being mounted vertically by means of angle brackets at the left and right corners of the panel. It may be also mounted in a cabinet, if it is so desired, although this is the least expedient method, since it would involve running connections in and out of the cabinet.

If the service man or professional set builder has a number of speakers to test, this device gives an excellent opportunity of switching from one reproducer to another at a moment's notice and be able to gain an idea of the comparative merits of each speaker. By the same token, it is possible to use a single speaker and have two radio sets hooked up, one feeding into the input binding post of set No. 1 and the other into the two binding posts of set No. 2 and then, by a flip of the double throw binding, note which of the two receivers gives the best results.

It is felt that on account of the simplicity of this device and the fact that it is quite inexpensive, it may find favor with many of our readers who are engaged in professional set building work and who might find a need for such a comparator.

Official Parts List

Parts required for constructing the comparator are shown below:—

- 1 DPDT porcelain base switch
- 2 SPST porcelain base switches
- 6 138-C General Radio switch contact
- 1 202 General Radio switch
- 1 Formica 7x13x $\frac{1}{8}$ inch black walnut panel
- 8 Eby binding posts
- 16 256 Frost pin jacks
- 1 Package Kester radio solder
- 1 Package Corwico Braidite hook-up wire

(This device designed, tested and all illustrations made in our laboratory)

Many Uses in Shop for a Laboratory Design Grid Dip Oscillator

Professional Set Builders May Profitably Add This Sensitive Device to Their Workshop

FROM time to time our laboratory has been called upon to design small equipment for test purposes which may be profitably used by the professional set builder in eliminating the possibility of error, decreasing the amount of time involved in servicing receivers, or for many more or less simple measurements covering any type of receiver or power supply upon which he may be called to work. In previous issues of the magazine the readers have been told how to make an ohmmeter such as the one described on Page 83 of the September, 1928, issue, a vacuum tube volt meter such as the one described on Page 95 of the March, 1928, issue, and other small units in older editions of this publication.

Matching Coils

Recently we have had many requests for construction data and operating notes on a grid dip oscillator or meter by means of which the professional set builder may match coils, determine the fundamental of inductances or their harmonics, ascertain the frequency at which a receiver is responsive at any point within the broadcast or short wave bands or the use of some means whereby a receiver may be calibrated against a standard signal source.

With this in view the laboratory staff has turned out the small and efficient grid dip meter described in the following article. In such a device it was thought best to utilize a tandem condenser for simultaneous tuning of the plate and grid inductances since this particular method of tuning seems to be the most efficient as far as maintaining the calibration of the instrument is concerned, which is quite important if the operator wishes to make any fine measurements. It was also felt that some means should be included whereby the oscillator could be modulated from a separate source and provision was made in this respect by the inclusion of a 5000 ohm resistance in the grid return across which the modulation source, such as a buzzer, may be used.

The schematic circuit shown in Figure 3 relates the electrical details of this grid dip meter, whose chief function is to indicate resonance between its own associated circuits and a circuit under measurement or comparison. This indication of resonance is accomplished by the drop in grid current at the position of resonance between the grid dip meter coil and another coil under measurement. For example, if when the meter is turned on the milliammeter in the grid circuit were to read one milliamper and then an inductance were placed in fairly close proximity to the plug-in coil on the grid dip meter and the tandem condenser rotated at the point of resonance, the meter needle would show a pronounced dip towards zero, the depth of this dip depending upon the inductive relation between the coil under measurement and the coil of the grid dip meter. If the two coils are too close together, the dip will be so pronounced that the tube will stop oscillating and the needle will drop to zero. On the other hand,

if the coil is too far away, there will not be enough transfer from one circuit to another to cause the meter needle to dip at all. Consequently in testing for a dip the coil under measurement should be tried at various distances until it is possible to let the needle drop into the crevice or the lowest portion of the dip without jumping jerkily upwards.

Determining Frequency

When the bottom of the dip has been ascertained, if the device has been calibrated, the operator will know the frequency at which resonance has been established by referring to the chart which he makes up when calibrating his own meter. In the event that the meter is not calibrated but is placed adjacent to a calibrated wave meter, the frequency of resonance may be determined when the wave meter condenser is rotated across its scale and causes the needle of the grid dip meter to drop.

Some distinction should be made between the dip of the meter, itself, at a fundamental of a coil being measured and the dip of a meter at one of the harmonics of the particular coil being measured.

For example, if the meter reads one mil before the coil is placed near it, and the dip drops down to a half mil when the resonant position is found for the fundamental, then when a harmonic of this coil is encountered the dip will be slight and may only be a small fraction of the depth secured on the fundamental. This fact alone will frequently show the operator whether he has the fundamental of a coil or one of its harmonics.

Used as Driver

When the meter is to be used as a driver, it can be set for a definite frequency in accordance with the draft made by the operator to cover the calibration of his particular meter and then a receiver tuned against this standard unmodulated signal source. If a modulated signal is desired, a battery and buzzer may be connected through a condenser to the modulation terminals shown in Figure 3, and this will generally produce enough energy for modulating on ordinary work.

In order to make the meter flexible so that more than one type tube may be employed in accordance with the demands upon the meter, a 30 ohm variable resistance has been shunted across the terminals of the milliammeter in order to prevent the meter from running off scale. If a 199 tube is used, it is quite likely that no shunt resistance will be required at all. However, if a 201A tube is used, it is more than likely that some resistance will have to be placed across the meter in order to prevent its running off the scale. This is still found true if a 210 tube is used with a higher plate voltage.

The .006 mfd fixed condenser located between the lower extremities of the plate and grid coils is for the purpose of causing

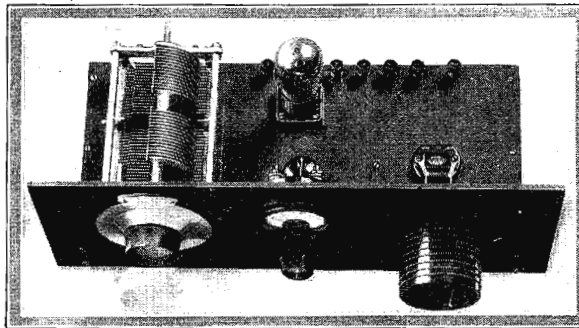


Fig. 1. In this photograph may be seen practically all of the parts required for the grid dip meter described in the accompanying article. On the front panel are located the laboratory vernier dial, the milliammeter, the 30 ohm variable resistance, and the four General Radio jacks into which the inductances are plugged

(This meter designed, tested and all illustrations made in our laboratory)

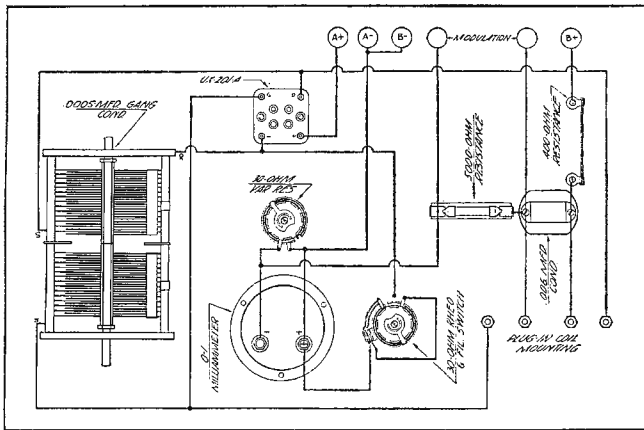


Fig. 2. The graphic illustration above shows the simplicity of the completed meter and should be used by the novice in wiring it up

the tube to oscillate over the entire scale so that regardless of whether the condenser is set at zero or a hundred it will oscillate. However, it may be found that the strength of oscillation will be greater at one end of the scale than at the other, but this is not a detriment since such a grid dip meter cannot be depended upon as a constant output device.

In matching the inductance of open coils, that is, coils without any capacities across them, the first inductance is placed near the grid dip oscillator coil and the dip found. This is noted on the oscillator dial and then the next coil is placed near the grid dip coil. If the dip comes at exactly the same point, for all practical purposes the coils may be said to be of equal inductance. In reading the dial, it is possible to read in tenths plus and minus. When the top marker line and one of the dial divisions are exactly straight, that is the particular setting of that condenser. It will be noticed that when the marker line and any one dial division line are exactly straight, that all other lines to the left and right of this will be slightly off. This vernier action is quite accurate and is simple to read after a little practice.

In many cases where it is not desired to move the coil under measurement and the oscillator, the use of a pie plate placed between the two coils, or partly between, will be the equivalent of changing the inductance relation of the coils, since it will distort the magnetic field. Very fine variations of coupling may be secured in this way that could not be secured by moving the coil itself.

With this meter, it is also possible to determine the wavelength range of a variable condenser across an inductance. The condenser is first placed across the inductance and the wavelength noted when it is set at zero capacity. The condenser is then turned to maximum capacity and the wavelength again noted, as shown by the oscillator. These two settings will give the wavelength covered by that particular condenser. In the event that one has two fixed condensers of presumably equal capacity and wishes to assure himself of that fact, the condenser may be placed across any given inductance and the fundamental found. Then the condenser is moved and the second fixed condenser placed across the inductance. If the dip occurs at exactly the same point with the first and second condenser, it is presumed that the capacities are equal.

The average professional set builder will not require more than four coils to cover the existing bands, which coils are made by General Radio and are known as the 384A, 384B, 384C and 384D.

Range of Coils

The range of 384A is from 15 to 30 meters when tuned with a .0005 mfd variable condenser. The range of the 384B is from 30 to 80 meters, that of 384C from 70 to 200 meters and 384D, from 190 to 575. Thus the last coil covers the entire broadcast band, while the three preceding types cover the range from 15 to 200 meters, which is ample for any experimental or professional set building work.

While all of the previous ranges given are for ordinary purposes, nevertheless it is possible to obtain sets of coils all the way up to 30,000. For example: 384-E runs from 565 to 1700 meters; the next coil, which is 384-F, runs from 1700 to 4400 meters; after that comes 384-G which tunes from 4400 to 12,000 meters; the last coil in the series is 384-H, which tunes from 12,000 to 30,000 meters. This information might be of value to some of the foreign experimenters, who have occasion to deal in long wave work, and possibly some of the American professional set builders might be interested in those particular ranges.

Parts required for the construction of this meter are shown in the following list:

- 1 DS 25 Amsco .0005 Tandem variable condenser
- 1 Sangamo .0006 mfd fixed condenser
- 1 8400 Yaxley 400 ohm fixed resistance
- 2 530 Yaxley 30 ohm junior rheostats
- 1 500 Yaxley rheostat switch
- 1 Electrad grid leak mounting
- 1 Durham 5000 ohm cartridge resistance
- 1 Formica 7x18x1/8 inch black front panel
- 1 Formica 7x16x1/8 inch black sub-panel
- 6 XL bakelite binding posts
- 1 531 Frost socket
- 1 VND National 100-0 laboratory dial
- 4 274J General Radio jacks
- 1 8629 Benjamin bracket
- 1 301 Weston 0-1 milliammeter
- 1 384A General Radio plug-in inductance
- 1 384B General Radio plug-in inductance
- 1 384C General Radio plug-in inductance
- 1 384D General Radio plug-in inductance
- 1 Ceco or Sonatron 199 or 210A type tube
- 1 Package Kester radio solder
- 1 Package Corwico Braidite hook-up wire

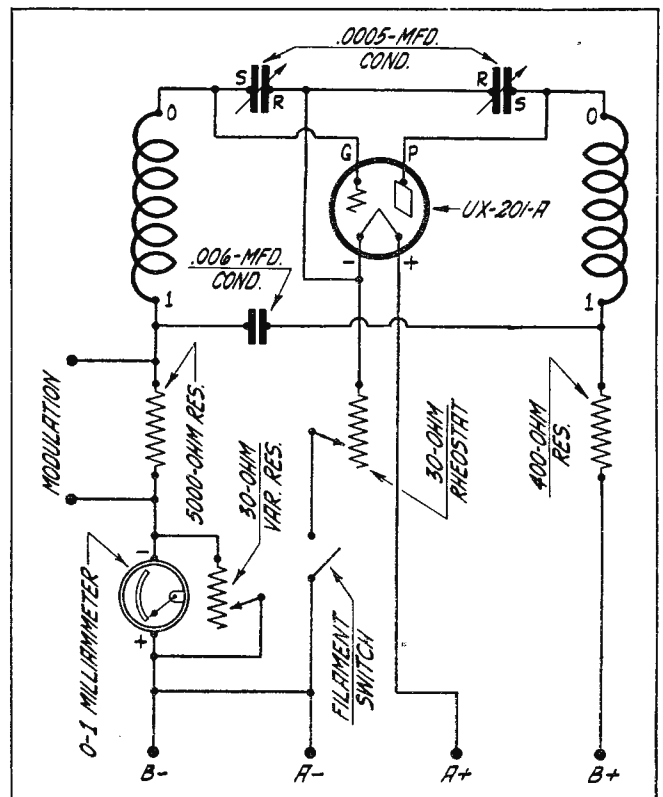


Fig. 3. Those well acquainted with radio terms will readily recognize the electrical characteristics of the grid dip meter by referring to the schematic printed above

The ABC of Radio

BEGINNING with this issue, we are including the above department for the benefit of two classes of our readers; the first being the type who would like to have a simple explanation of the operation of various parts in a radio receiver, power supply or accessory, and the second class being those of the younger generation who are just becoming interested in the radio art and would like to have an outlet for their creative faculties in the construction of simple, compact, inexpensive and efficient receivers of the 1, 2, 3 and 4-tube type.

Thousands of Newcomers

Every year there are thousands upon thousands of boys who reach an age when radio becomes an absorbing topic to them. Many of these boys are able to get the fundamental principles of the art from their work in the manual training classes at schools where radio is included in the curriculum. However, there are many schools where no radio is taught as yet and, as a consequence, these youngsters do not have an opportunity of getting information of a simple nature which will be helpful to them. While it is true that technical information is found on all sides, nevertheless, clear data for the novice is not available.

Influence For Good

Radio, as an influence for good, is being accepted now by many parents who see in the art an opportunity for encouraging craftsmanship and ambition on the part of young boys. Aside from the purely educational aspects of radio for boys, there is the possibility of making a profit from the construction and sale of radio sets.

With this in mind, we have recently observed that a group of the largest and best known radio manufacturers are looking ahead to the growth of the radio business, and to insure a supply of trained talent for the future big jobs in radio, these manufacturers have planned to give to worthy boys, gratis, a practical course in radio design and construction under the direction of a well known radio engineer.

Every boy will have his chance to qualify as a future radio engineer, to develop hidden talents that may make him another De Forest or Armstrong, or to equip himself to later enter the radio business "on his own," if that is his ambition. These manufacturers have started what is known as the Junior Radio Guild, a national group of boys who are studying and building radio apparatus under competent guides. The boys will be taught the first fundamental principles of radio, what it is, how it works, definitions of technical terms, how to read diagrams, etc. Next they will advance to the actual building of an efficient 1-tube receiver so arranged that they can later add to it step by step until finally they will have as fine a modern receiver as it is possible to build, plus the great thrill of having built it themselves, an accomplishment of which any boy may be well proud.

As a result of this course, the boys will have had a sound, practical, working knowledge of radio that will enable them to build any type of receiver desired, build receivers for others at a profit, or qualify to enter the great growing radio profession and make an important place for themselves.

There is always need for new blood in the ranks of professional set builders and after boys have completed their preliminary training through the Junior Radio Guild, they are then in position to appreciate and make use of the material appearing in this magazine under the department heading "With the Professional Set Builder." An indication of the importance placed by the manufacturers on professional set builders may be gained from watching the amount of co-operative work expended by the different manufacturers on behalf of the professional set builders.

Further information concerning the Junior Radio Guild may be secured from this department.

In future issues of this magazine, we will print, from time to time, for the benefit of boys such information and diagrams as will be helpful to them in their work. In other words, this department will in effect become the official organ for the Junior Radio Guild.

How Dynamic Works

DYNAMIC speakers this season have created such a tremendous interest on the part of the public that it is felt a simple description of a speaker using the dynamic principle will be of interest to newcomers in the radio art, as well as those who have perhaps not given much thought to the reasons for the operation of this new type speaker.

In order to clearly understand the mechanical operation of the

now popular electro-dynamic speaker it is quite necessary to understand the theoretical operation. As the fundamental operation of this type of speaker is based on the laws of electromagnetism it might be well to refresh the mind a little on this subject.

As will be well remembered all magnets have two magnetic poles, which have been identified as the north pole and the south pole. From these poles there is emitted what has been termed magnetic flux. It will also be remembered that the magnetic flux will come out of the north pole, travel in an arc around the surface of the magnet and enter the south pole, travel through the magnet to the north pole and thus be emitted once again. The strength of the magnet will depend on the strength of the charging flux and the permeability, upon the permeability of the iron used. There are, roughly, two types of magnets, the permanent magnet and the non-permanent magnet. The electro-dynamic comes under the latter class.

In the electro-dynamic speaker the principle of the electro-magnet is used and some explanation of its operation will be given. It will be remembered from the right hand rule that if

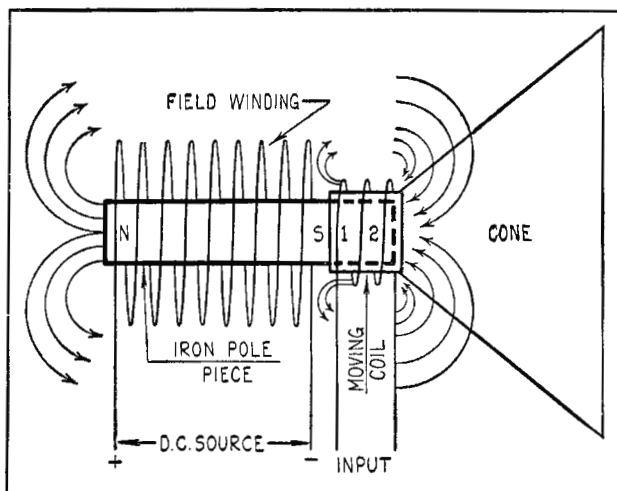


Fig. 1. This simple drawing gives an idea as to the operation of a Dynamic Speaker, a description of which is given in an article in this department

the right hand, with the thumb extended ninety degrees from the fingers, is placed around a coil with the fingers pointed in the direction of the winding and the flow of current (positive to negative) that the end of the coil in the direction of the extended thumb will be the north pole of the magnetic flux and also the direction of travel of the magnetic flux and also the north pole of any piece of iron that may be on the inside of the coil. It will also be remembered that in two magnets opposite poles will attract each other and like poles will repel each other. This is the principle upon which the electro-dynamic speaker operates.

In the diagram in Fig. 1 you will notice the large field winding which is placed around an iron core of very low permeability. Over and around one end of the iron core will be seen the floating moving coil and attached to this coil is the cone. If a direct current is on the field winding in the manner illustrated, with respect to positive and negative, the left hand end will obviously become the north pole and the right hand end the south pole.

When the output of the receiving set is placed on the terminals of the moving coil there will be an alternating current induced in this coil inasmuch as there is an alternating current flowing in the plate circuit of the tube which responds to the received signal. When the positive half of the cycle enters the left hand end of the moving coil number 1 will become the north pole of the coil and number 2 the south pole and as the right hand end of the iron core is the south pole the iron core will attract the moving coil due to unlike poles attracting and pull the coil into the field winding.

When the other half of the cycle which is negative enters the number 1 end of the moving coil the condition is reversed and number 1 becomes south and number 2 becomes north. Thus the moving coil will be pushed away from the field winding due to like poles repelling. This condition will repeat at a rate of speed corresponding to the frequency of the alternating current, which is the frequency of the voice or music. As the cone is attached to the moving coil it will also move in and out in unison with the moving coil. As this movement is very rapid and the cone very light it will set loose a series of mechanical vibrations in the air, due to concussion, which the ear will interpret as music or voice.

Wave Motion

MANY newcomers in radio have often been puzzled as to the method of reception employed in radio telephony. They cannot seem to understand why a program may be transmitted from a distant station and picked up by a receiver when there is no visible connection between the two stations. Many who can appreciate, at least in part, how a telegram is sent or how a long distance call over the telephone is handled, nevertheless are at a loss to understand the principles involved in the transmission of a program of one station to another over great or small distances.

Perhaps the easiest method of getting a word picture of the transmission process is to liken our air to a pond of water, and to liken the transmitting antenna to a springboard, from which divers are constantly jumping into the pond. As each one of the divers strikes the water, a series of circular water waves is set up upon the diver's impact. These waves travel outwardly in increasing circles until the resistance of the surface of the pond gradually diminishes the water wave motion and the wave ceases to exist. The transmitting antenna is energized by associated apparatus in such a fashion that the air surrounding the antenna is thrown into violent motion, similar to the diver striking the water, except that the waves set up by the antenna are electrical waves rather than water waves. In the case of a few divers jumping off from the springboard previously referred to and striking the water, the waves set up by each succeeding diver are visible if the interval between divers is sufficient. However, if these divers were to follow each other at intervals of a tenth, or a hundredth or a thousandth of a second, the waves set up by the divers would not be visible to the eye, because of their rapidity. By the same token, if the transmitting station

only sent out an impulse every so often, the surrounding ether would not be shocked or agitated at a sufficiently rapid rate and as a result the waves set up in the ether would be very low rate. As it happens, however, these waves are set up by the transmitter with great rapidity and as a consequence there is a perfect stream of ether disturbances in progress around a transmitting antenna when the transmitter is in operation. These ether disturbances travel with the speed of light, which is 186,000 miles per second. Of themselves the waves are inaudible and imperceptible to our unaided senses. In order to appreciate these waves, it is necessary to interpret them by either a mechanical or electrical device. In the olden days mechanical devices were used for detection, such as the tikker wheel; later the magnetic detector was utilized and along with it the electrolytic and crystal detectors and finally the tube detector, the latter being in use today and giving every indication of remaining our most efficient detector for many years to come.

Outside of Hearing

The waves set up by the transmitting antenna being sent out with such terrific rapidity are outside of hearing. Since they are inaudible, in radio parlance, it is stated that they are "radio frequency" waves, because they occur at a rate in excess of 10,000 cycles or times per second. Our limited sense of hearing will not allow us to hear sounds very much in excess of 10,000, so that in order to be audible, it is necessary for these rapidly vibrating waves to be translated to a lower rate of vibration, such as frequencies below 10,000 cycles, so that our sense of hearing may appreciate them. For example: if you were to put a telephone receiver in series with the antenna of your receiving set, you would not hear any broadcast programs, because the emitted frequency from the station would be too rapid for the diaphragm in the head phones to respond to, and while the program would be there, nevertheless you could not hear it. In the modern receiver, the waves from the transmitter, after having been intercepted by the antenna, are brought into the detector circuit at radio frequencies, that is, frequencies beyond audibility. The detector acts as an interpreter, translator or a frequency rate reducer. These radio frequency impulses, when striking the grid circuit of a detector, are partly deleted during one-half of the cycle and during the opposite half of the cycle are passing through to the plate circuit of the tube, frequencies that are interrupted at a low rate, so that with the head phones in the plate circuit a person can hear the program received. After the radio frequency energy which enters the detector has been rectified, it is then fed into an amplifier at audio frequency and stepped up in intensity to a point where a speaker may be actuated. There are two methods of amplification in any receiver. The first is amplification at radio frequencies to increase the strength of the infinitesimal weak, original impulse so that this strengthened impulse can make a decided effect upon the detector. The second method of amplification is at audio frequencies, so that the small amount of energy passing through the detector stage may be stepped up to a point where it will actuate a speaker for the entertainment of a room full of people.

As a general rule radio frequency amplification is used for sensitivity and audio frequency amplification is used for volume. The output of a receiver depends upon the amount of radio frequency amplification and of audio frequency amplification. Most power tubes today are rated according to their ability to actuate without distortion the conventional reproducers, such as dynamic speakers or electro-magnetic speakers. Years ago a 201-A was used in the last stage and we used to often wonder why voice and music was so stringy. Today we use power tubes capable of passing hundreds and perhaps thousands of times as much energy as the 201-A and as a result we get music or voice reproduction identical with the original program at the broadcasting station. Thus the output of a receiver has been increased thousands of times by the design of proper power handling tubes.

Body Capacity

One of our readers has recently written us requesting a defi-

(Continued on page 146)

Digest of Science



Horn Directs Blimp in Fog

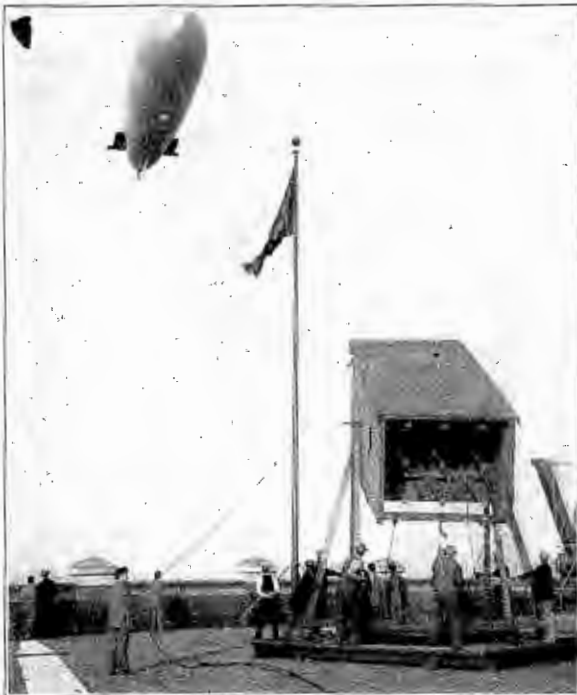


Photo Wide World

The dirigible, J-4, flying over the directional horn perfected by the Victor Talking Machine Co. of Camden, N. J., which aids in directing airships in landing in fog, during the tests of the new device.

Says Royalty Does Not Degenerate or Die Out

Royalty and old families do not die out because of their age, neither do they become degenerate and sterile because of their wealth and power, declares Dr. F. A. Woods of the National Research Council in a report to the American Genetic Association. Facts taken from the history of the British peerage furnish proof of this, he says, in contradiction to popular notions about inherited wealth and position. Since families and family names continue only in the male line, many old families have become extinct only because all the children of one generation were girls. It is not fair to say that old families are dying out because certain names are no longer found in the peerage.

Every instinct and desire of powerful and wealthy families would tend, biologically, toward their growth in strength and numbers, Dr. Woods points out, mentioning the desire for children, particularly sons, and the selective mating of aristocratic families, a mating designed to strengthen the family.

While nine out of a certain ten old families may have died out, due to a preponderance of girl children, the remaining one will

Plucky Girl Snaps Twister



Photo Wide World

A tornado "twister" touching the ground from a black cloud, as it was photographed by Miss Lucille Handberg at the risk of her life as the storm passed Sherman, South Dakota.

have branched out and ramified until fully ten important families of today can trace their descent from it in the male line.

Ultraviolet Passing Windows Declared Useless in Schools

Schoolrooms and offices should spend their money on outdoor sunparlors, rather than on the new windows that allow ultraviolet light to pass through, is the advice given by Dr. Walter H. Eddy of Columbia University at the meeting here recently of the American Public Health Association. In homes and apartments these windows would be a great mothers' helper, saving the mothers from some of the hours spent watching small children while they get their daily dose of sunshine.

Tries Sea Trip to Panama



Photo Wide World

Jordan D. Hill, a West Point graduate, will attempt to make the water trip from New York to Panama in a 13 foot outboard motorboat. Hill will avoid the open sea as much as possible in order to save his tiny craft from being swamped by the heavy waves. A waterproof tarpaulin makes it more seaworthy.

Dr. Eddy experimented with rats that were fed a diet that would result in rickets, unless they got enough sunlight to counteract it. These rats were placed in cages in front of the new windows at various distances and angles and for the same length of time. Only those rats directly in the path of the sunlight failed to develop rickets.

Life on the Air Lines



Photo Wide World
One of the ten passenger cabins on board the huge German airship "Graf Zeppelin," which finished its trans-Atlantic flight to New York recently.

Gas Fuel for Zeppelin Return Trip Ready

Three thousand cylinders of special gas fuel for the German dirigible Count Zeppelin are lying at Lakehurst, N. J., ready to fuel the ship for its return voyage across the Atlantic.

Unlike the Blau gas fuel that the airship used on its voyage to America, the million cubic feet of American product is made from fractionated natural gas and is a synthetic mixture of ethane, about the density of air, methane, lighter than air, propane and butane, both heavier than air. These gases are carefully proportioned until the resulting mixture has a density of 1.05, only slightly heavier than air. Arrangements for the supply of this gas by a Louisville, Ky., concern were made by the U. S. Navy as an act of courtesy to the German ship which is the guest of its sister, the dirigible Los Angeles, in its large two-berth hangar at Lakehurst.

Both the German Blau gas, so-called because it was first made by a German by that name, and the American substitute allow the dirigible to carry fuel which adds practically no load and does not make the ship lighter when it is burned, since it is nearly the weight of air.

Army Tests New Mobile Antiaircraft Gun Mount

A new type of mount for antiaircraft guns, which will be practically as mobile as ordinary field artillery carriages and yet as

Graf Over Berlin



The huge "Graf Zeppelin," now in America with a crew and passenger list of sixty, one a woman, as it flew over the Wilhelmstrasse in Berlin on its last test flight prior to the Transatlantic air trip.

solid and stable a firing base as the concrete foundations now necessary, is being tried out at the Aberdeen Proving Grounds near Washington. Ordnance officers declare themselves very well satisfied with the new device, whose existence has only recently been made public, after more than a year of secret preliminary work.

The mount is a radical departure from the wheeled types of mount hitherto tried for antiaircraft artillery. These shook and shifted so much under the stress of firing that they were all discarded as of no value. The new mount consists of four long steel beams that lie flat on the ground, spreading out from the gun platform at their center like the legs of an enormous insect. Each

Damaged Zeppelin



A view of the huge "Graf Zeppelin," taken in the Naval Hangar at Lakehurst, N. J., plainly showing the damaged left stabilizer that slowed up the air voyage and which might have proved disastrous.

Submarine Rescuer

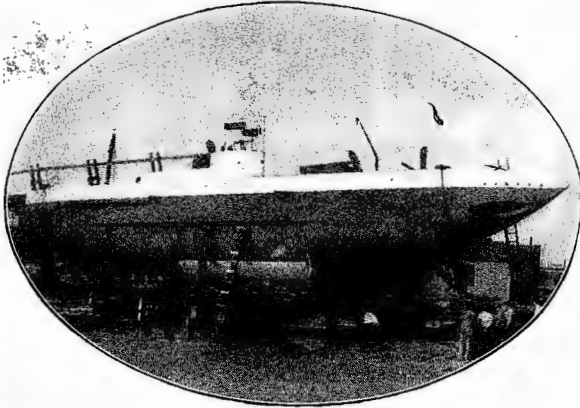


Photo Wide World

An entirely new departure in salvage craft for submarines has been devised by Simon Lake, submarine engineer, at his Bridgeport, Conn., plant. He and Capt. Sloan Danahower are working on Mr. Lake's 1906 submarine "Defender" turning it into a rescue craft for undesea boats. The feature of its construction is a diving compartment in the forward under side, which permits divers to do rescue or salvage work with their base of operations right alongside the sunken vessel. Air pressure is maintained in this chamber at the same density as the water in which the operations are taking place. Divers may enter and leave it at will. In addition to this chamber, the submarine will carry every known device for rescue and salvage work. The Navy Department is actively co-operating with Mr. Lake in its construction. The craft is only 97 feet long and 11 feet wide, but is capable of submerging to a depth of 250 feet.

leg is jointed, and is pivoted at the point of attachment to the gun platform, so that it can be folded compactly alongside it, and the whole lifted on rubber-tired wheels to be towed by a tractor or truck.

The mount can be prepared for action from march order in about ten minutes, and restored to march order in little more than the same time. Concrete gun foundations, the only other type giving comparable stability under firing conditions, require several days for their preparation.

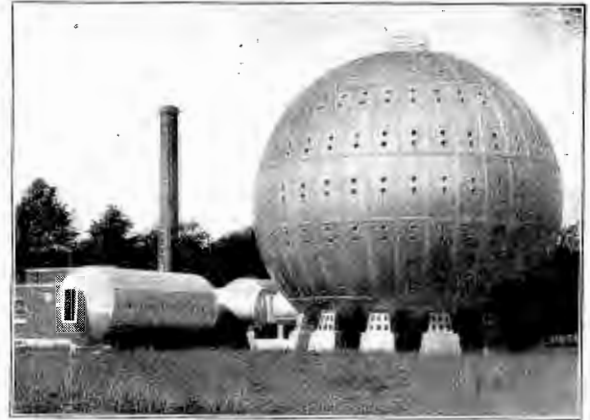
Rockets Propel Plane



Photo Wide World

Maurice Poirer of Burbank, Calif., shows a model of his "Spirit of Night," tri-motored monoplane equipped with 86 rocket barrels to Miss Anna Armstrong. He claims the plane will be able to span the continent in three hours. The three motors will get the big ship under way and the rockets, which are arranged in four banks of 16 chambers each along the rear fuselage of the ship, will then be fired to attain any desired speed up to 1000 miles an hour. Reloading may be done while the trio of motors keeps the ship in the air.

Treating Disease by Compressed Air



A view of the \$1,000,000 sanitarium which has been erected in Cleveland and where disease will be treated by compressed air.

New Tool Metal Cuts Glass and Porcelain

A new metal so hard that it will bore smooth holes in concrete, or cut screw threads in a glass rod, was exhibited recently at the convention of the American Society for Steel Treating.

The new material, known as carboloy, and consisting of tungsten carbide, a compound of tungsten and carbon, and cobalt, a metal like nickel, is the invention of Dr. Samuel L. Hoyt, of the research laboratory of the General Electric Co. It is so hard that it will cut glass like a diamond, and will even scratch a sapphire, which is next below the diamond in the scale of hardness. Ordinary steel tools are quickly worn down when held against an emery wheel, but the new metal itself wears down the wheel.

Soap Dust Latest Explosion Hazard

Soap flakes and soap powders, being extremely explosive, take their place as the latest industrial hazard. Certain kinds of soap dusts when suspended in air are more violently explosible than most other industrial dusts, according to tests made at the Experiment Station of the U. S. Bureau of Mines at Pittsburgh.

These soaps are easily ignited and explode violently, accompanied by much flame and large quantities of heat. This is in

Odd Radio Set



A radio set built in a glass jar containing one tube. The set was submitted by Harry De La Force, of Montreal, Canada, and exhibited at the Chicago Radio Show.

spite of the fact that soap is a compound of semi-organic nature and that sodium compounds in general have a cooling effect on the flames of explosives.

Radio Waves Produce Artificial Fever

A brand new method of experimentation in physiology that may very likely prove a new method of cure for certain diseases is opened up by recent work at the Albany Medical College by Dr. Helen R. Hosmer. She has been making a careful study of the effects on animals of short radio waves of from 25,000 to 10,000 kilocycles (12 to 30 meters). The effect was noticed when bystanders around a 20 kilowatt 5 meter transmitter found their temperature was raised. The mouth temperature of one person rose 2.2 degrees in fifteen minutes, while others showed a somewhat smaller rise, or fever.

Plane Flies Vertically



Photo Wide World

The "Autogiro," invented by Juan de LaCierva, a former member of the Spanish Parliament, who successfully flew the "foolproof flying machine" from Croyden, England, across the channel to Le Bourget—the longest flight ever made in a plane of this type.

Dr. Hosmer has measured the effect of the waves from a special 750 watt transmitter, in heating a weak solution of ordinary salt. Such a salt solution is very similar to the fluids of the body in its behavior. The rate at which the temperature of the solution rose depended on the wavelength and the strength of the solution. With a frequency of 25,000 kilocycles, corresponding to 12 meters, a strength of one part of salt to 2000 of water was heated most rapidly, while with 10,000 kilocycles, (or 30 meters) a solution of only half this strength was heated at the fastest rate.

When a tadpole was placed between the condenser plates, its temperature rose three degrees in 31 seconds while it was alive and 12 degrees in 2 minutes after it was dead. This was with a single tadpole, when there were a number together the rate of heating was higher. Experiments were also made with rats.

World's Greatest Lens Made in U. S.



Photo Wide World

The largest American made lens in the world is now being made at the United States Bureau of Standards, and is here shown just after an eight inch hole was drilled through the center. A. N. Finn of the Bureau is shown examining the hole. The lens is 70 inches in diameter and weighs two tons.

Why Rheumatic People Can Forecast Storms

An explanation of the fact that even when the sky is clear and only a lowered barometric pressure indicates an approaching storm, people with rheumatism "feel it in their bones," and many animals can tell in various ways that it is going to rain, is found in the result of an experiment made by Dr. C. S. Smith of the University of Chicago.

Restlessness due to water retention under low air pressure is suggested as the cause of such premonitions of storms.

In the experiment, dogs and rats were placed in a glass walled tank in which the air had a low barometric pressure. Their diet

Plumb Depths by Radio



Photo Wide World

Dr. Herbert G. Dorsey of the Coast and Geodetic Survey with the instrument which he invented for taking radio soundings of ocean depths. The device sends out a continuous signal which is returned from the bottom of the sea as an echo and picked up by a sensitive radio receiver which amplifies it and indicates on a dial the exact depth.

Sculler Has Fish Tail Effect



Photo Wide World

To simplify sculling so that even an untrained person can operate in this manner, a French inventor has developed an apparatus working on the principle of the fish tail. All that is necessary to make the boat move forward is to swing the tiller back and forth. The two "fins" bend slightly as the two parts of a fish's tail, giving the proper propelling surface. They can be mounted on any row-boat in addition to the usual oars.

and water intake and elimination were carefully measured. Very little water was eliminated in proportion to the amount drunk or taken in food.

Dr. Smith suggests that in the low barometric conditions preceding a storm, animals retain water in their tissues. Certain animals including human beings who have rheumatism are sensitive enough to recognize the restlessness caused by water retention. After a few experiences of storms following the sensation rheumatic persons are able to predict bad weather.

Government to Study Aerial Lightning Hazard

The lighting hazard to government flyers has become so pronounced that the Daniel Guggenheim Fund for the Promotion of Aeronautics has announced that a widespread investigation of the subject will be conducted in the near future in conjunction

Radio Helps Education

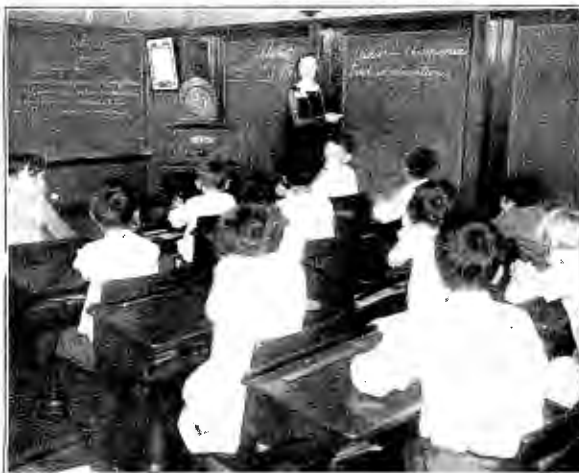


Photo Wide World

Radio, as a new means of teaching school children, has been introduced in Chicago schools, where travel talks, lectures on art and music and other topics are offered daily to the various grades at different hours. Slides and moving pictures are also used in connection with these broadcasts. The photo shows a class in the Lawson School listening in on the radio program with R. M. Robinson, their teacher, doing a bit of explaining.

with the Army Air Corps, the Navy Air Service, and the Aeronautics Branch of the Department of Commerce.

The danger of the proximity of a highly charged cloud to the airman is two-fold. There is the lightning hazard and there are wind gusts, both vertical and horizontal, which make it almost impossible for even the skilled pilot to control his plane.

For months government experts have been working on the problem, but thus far no remedy has been found. Ballons seem to be particularly susceptible to the lightning menace and it was early suggested that helium gas, being non-inflammable, might be used instead of hydrogen, which is inflammable.

Airplanes likewise have their share of lightning tragedies,

Giant When Columbus Was Here

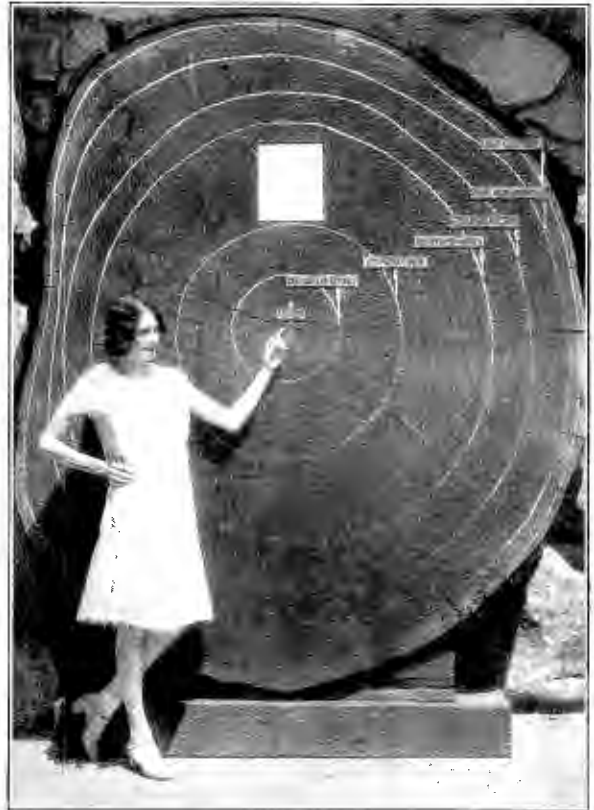


Photo Wide World

More than a century before the battle of Hastings, the giant tree, from which this cross section was cut, was starting life as a young sapling, according to calculations made at the Yosemite National Park Museum, where it is being exhibited. Miss Lynne Tompkins of Los Angeles is pointing to the estimated date of A. D. 923 when the tree, a "Sequoia Gigantea," is believed to have begun life. At each ring on the mammoth trunk is a card bearing the approximate date when the tree was that size and a historical event of that year. These indicate that the big cedar was a giant when Columbus discovered America.

notably that in which Lieut. Carranza, Mexican good-will flyer, recently lost his life. Suggestions have been made that experts work to the end of inventing an especially devised meter whereby the pilot can estimate the positive or negative charges of his craft and neutralize them by means of a light metal screen not unlike the well known-screen used over radio apparatus.

X-Ray Movie Camera Shows Inner Secrets of Growth

The inner secrets of the growth of a rosebud, as it slowly unfolded through a three-day period, have been recorded on a motion picture film by means of a new X-ray movie camera invented by Arthur C. Pilsbury, Berkeley, Calif., naturalist-photographer. The potted rosebud was placed before the camera, and every five minutes for 72 hours a new 4-inch film was moved into place and exposed to the rays as they passed through.

Science Aids Radio Manufacturers

SCIENTIFIC methods of manufacture are contributing considerably to the efficiency of the present day radio receivers. There is not a part of radio manufacturing in which this statement shows up more clearly than in the construction of filter and bypass condensers. These condensers must stand up under the hardest possible service conditions and nothing may be overlooked in their manufacture which would tend to limit their life or efficiency at the different working voltages.

In the photograph shown in Fig. 1 may be seen a power winding machine developed by the engineers of the Leslie F. Muter Co. of Chicago. The machine is completely enclosed to keep



Fig. 1

away any foreign particle from the paper and foil during the winding operation and is operated by a d. c. motor controlled by a rheostat, which in turn is operated by the foot treadle which may be seen in the photograph. A revolution counter is visible at the middle of the winding mandrel, which informs the operator at all times the exact number of turns on the condensers. A few of the windings are shown at the left side of the machine just as they have been removed from the mandrel and pressed slightly to stack them for further operations.

In the photograph shown in Fig. 2 may be seen an operator placing condensers in the vacuum dryer. This photograph also gives a clear view of the surface condenser and steam boiler,

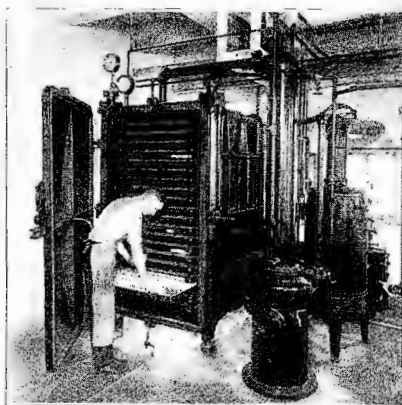


Fig. 2

behind which is located the direct driven vacuum pump. The vacuum and steam gauges are shown on top at the left of the dryer. These gauges reveal the true condition of the inside of the chamber at all times. This is supplemented with an additional peep hole, shown just above the center of the open door.

As the condensers are wound, they are placed on the vacuum

Lights Through Fog

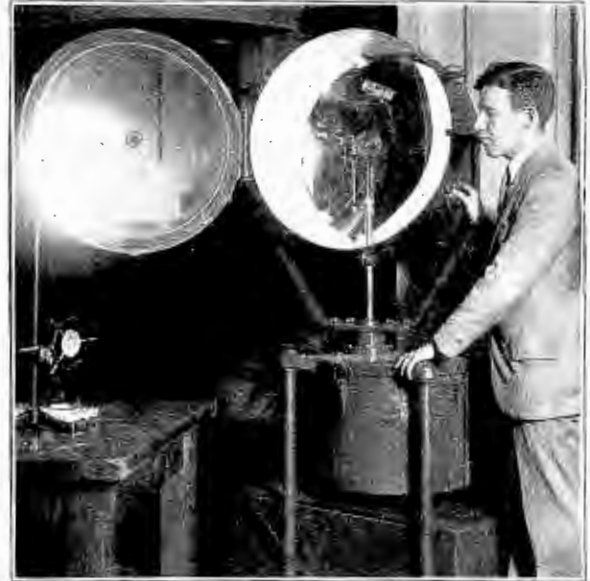


Photo Wide World

At the first Fall meeting of the New York Electrical Society at the Engineering Building, recently, Dr. E. E. Free, New York engineer, displayed to a lay audience some of the phenomena of the rare gases recently brought to light in scientific experiments. He demonstrated how it was possible for the red rays made by a Neon gas beacon to be seen through fog and smoke. Placing a small model of an air-field beacon beside an ordinary incandescent lamp side by side, he produced a smoke screen between them and his audience. As the ordinary light faded from view the Neon lamp stood out in striking contrast.

dryer on trays in a single layer to give as much heat contact as possible. The dryer chamber is heated about one hour, with the door slightly open to assist radiation. The door is then clamped and the vacuum pump started. Vacuum is maintained for four hours, which removes any trace of moisture that may have remained after the baking operation. While these operations could be combined, the manufacturers find it advantageous to do them separately, owing to the small amount of radiation in a vacuum and the necessity of completely removing any trace of moisture in the condenser. The vacuum used in this work is always within $\frac{1}{2}$ inch of the barometer, which can be considered almost a perfect vacuum under production conditions.

These are but two of the many scientific manufacturing methods employed by the Muter Company in their new and modern Chicago plant.

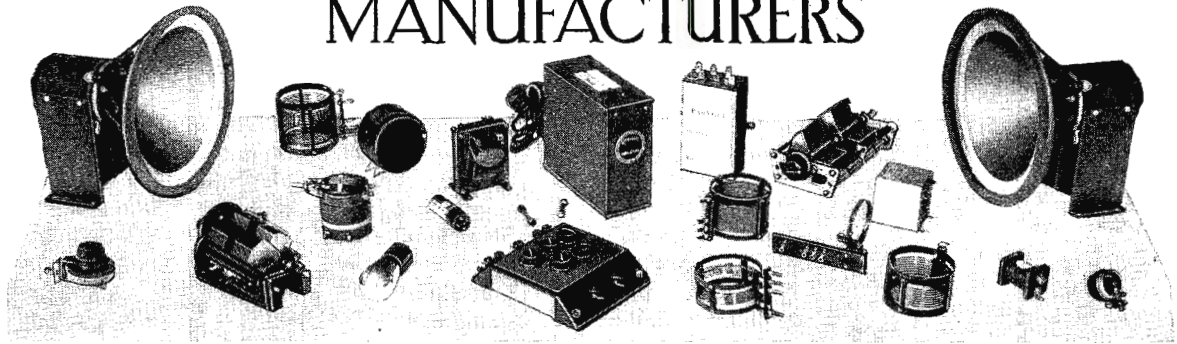
This Is What Bomb Looks Like



Photo Wide World

Some of the huge bombs which were carried by the British bombers during their theoretical air raid on London to demonstrate the vulnerability of the metropolis. Some of the bombs carried weighed 580 pounds.

WITH THE ACCESSORY & PARTS MANUFACTURERS



Knapp "A" Powered Electrified Sets

Simple Filament Supply May Be Made to Electrify Filaments of
Any Home or Factory Built Receiver Using 199,
201-A, 202, 240, 112-A or 171-A Tubes

ALMOST a year ago laboratory findings on a device called the Knapp "A" power unit were given. This had been developed to electrify the filament end of any existing home or factory built radio receiver which employed tubes of the 199, 201-A, 222, 240, 112-A or 171-A class. These tubes require a direct current supply source as opposed to a. c. for the 226 and 227 types.

At that time, as a matter of fact today also, the radio public was demanding sets with an entirely self-contained unit operating directly from the regular house lighting system.

"B" eliminators or plate supply devices delivering practically any required voltage and current independent of battery power had been proven successful over a period of several years. It was therefore logical that the ever present and principal cause for radio annoyance—the "A" battery—was the only remaining drawback from placing radio in a really enjoyable position. It is easy to see ample reason why the public then and now demands a receiver which will operate from a convenient lamp socket without annoying troubles.

An "Electrified" Receiver

In the mind of the average radio set owner an electric set is nothing more or less than a radio which operates directly from a lamp socket. It's a simple and homely definition, but this type of apparatus, plus a cabinet having good eye-value practically makes up the entire specifications. The apparatus proper, or that which is "under the cover," is just some form of scientific development—how or what makes it work is of minor importance. A periodical overhauling such as the replacement of tubes, or repair of a loose connection and the like, is about all the attention a modern radio set should require. These are the specifications in a nutshell.

Of course the actual construction and operation of present day radio receivers employing vacuum tubes is far more complicated

than this simple analogy would lead us to believe.

In modern radio sets it will be found that the vacuum tubes required for picking up the minute radio frequency signals from a distant broadcaster, the detection or rectification of this radio frequency energy, and finally the amplification of its audio components makes it essential that the vacuum tubes in the several positions be operated by the application of the following voltages in addition to the incoming signals:

- (1) A direct current source for the plate system.
- (2) A steady voltage (d. c.) for biasing the tube grid circuits.
- (3) A direct or alternating current supply for heating tube filaments.

It is with regard to the last mentioned item that we find the real bone of contention—and why the average set owner calls any receiver an electrified set just so long as no batteries are employed. Hereafter in this article it shall be assumed that in all cases some form of rectifier system or socket-power device is being used in supplying the plate and grid d. c. circuits of all tubes.

And from this, as most everybody understands, it was the storage battery used in energizing tube filaments which constantly gave trouble by either (1) becoming discharged at the wrong time, (2) failing to hold a charge or (3) requiring water. This latter, in addition to the

acid odor caused by filling, was in itself a sloppy job—frequently the cause of ruined rugs and perhaps the radio cabinet itself.

Most storage battery chargers, while being fairly efficient devices, also contributed their share of trouble. Here was simply another auxiliary affair which, like the storage battery, was acid, filled and required watering. In addition to this, certain types never stayed in adjustment, while in others the rectifier tube burned out. All things considered, the charging of batteries seldom was an automatic and entirely satisfactory operation.

From the above we learn that the grid and plate circuits of all receiving tubes function in very nearly like manner, but the real

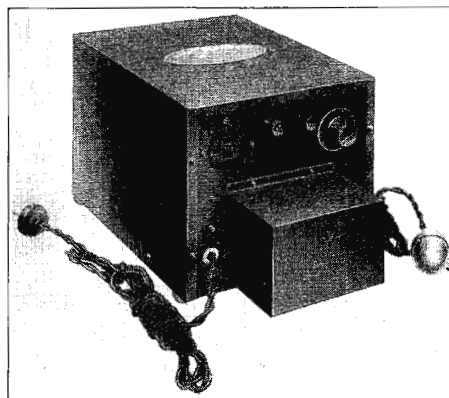


Fig. 1. This photograph shows a view of the Knapp "A" power unit described in the accompanying article

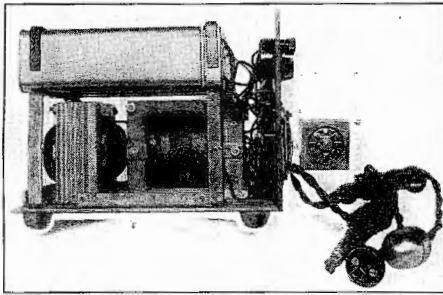


Fig. 2. This photograph shows the inside of the Knapp "A" unit described in the accompanying text

difference is found in the method of energizing or heating their filaments. Receivers employing tubes of the 326-226 and 327-227 class have filament structures which are especially designed to be operated at alternating current of low voltages as supplied from house lighting sources. All other tubes such as the 199, 120, 201-A, 222, 240, 112-A and 171-A, except in the last audio stage, are operated from a direct current supply. For this purpose a storage battery was formerly about the only available supply.

Like most other things, a. c. filament type tubes have their good and bad points. Of course any device which depends merely upon an initial power supply furnished by large central stations naturally limits to a small degree the possibility of failure in service.

One Solution to the Electrified Set Problem

In order to realize full receiver electrification (operating the filaments from a central station source via the lamp socket) in much the same way as for a. c. filament tubes, the identical degree of simplicity can be had by those using d. c. tubes of the 199, 120, 222, 240, 201-A and 171-A.

The method described below consists merely of a high current low voltage rectifier system, with a potential dividing and filter network. This arrangement converts our house lighting alternating current into a steady direct current for the operation of any tube. Certain large receiver manufacturers have already adopted the same method.

New Knapp "A" Power Device

This assembly completely eliminates all "A" storage or dry batteries of all types as well as chargers and trickle chargers. There isn't a moving part on it—and nothing to replace except a metallic rectifier every year or so. Unlike a. c. tube operation, this device completely replaces the old battery system without changing even a single wire within the set.

The various parts for the new Knapp "A" power device may be purchased on the open market. For those not mechanically inclined, it is believed such a unit can also be obtained in finished forms.

Operating Notes

After the wiring has been carefully checked, fasten the front panel to the base-plate assembly by means of the two screws, item 27. The rectifier unit, R, item 7, should now be placed on the five contact posts, and the holding nuts then firmly tightened. The outfit is now ready for a preliminary test. Using the attachment cord plug, connect to an alternating current house-light lamp socket and press the red button on the pendant switch.

Now connect the "A" plus and "A" minus leads from the radio set to the binding posts similarly marked on the panel front of the Knapp "A" power device. The switch arm of the special eight point switch should be set to indication A. And if a "B" eliminator is employed, the latter's plug attachment cord should be inserted in the "B" eliminator receptacle on the front panel.

If no broadcast signals are heard, advance the switch knob one point at a time until the tubes attain their proper brilliancy. Preferably, if a voltmeter is at hand, adjust the switch until the binding post terminal voltage reads six when all tubes are burning. Should everything check O. K., fasten the box body, item 14, to the base assembly and front panel, using screws, item 27. The rectifier cover, item 25, may then be fastened to the front panel; the cover should have the large square opening facing

downwards. A final step is to clamp on the top box cover, item 15.

The Knapp "A" power unit works equally well with "B" batteries or "B" eliminators. It is suitable for use with any radio set having up to eight tubes. A 6 volt supply is correct for all receivers employing 201-A, 112-A 171 and 171-A type tubes. Once the proper voltage adjustment has been made no further voltmeter readings are necessary nor is any other attention required.

For small sets such as those using three or four tubes it is advisable to install a 6 or 10 ohm rheostat in the "A" minus lead wire so as to reduce the output voltage to 6. Under no circumstances should the tubes be operated above the rated voltage specified by their manufacturers.

When turning the radio set "on" or "off" use the pendant switch provided leaving the filament switch of the receiver always in the "on" position. By following this practice the set may be controlled entirely by the pendant switch—an electrified radio.

Parts Needed

Parts required for the Knapp A power unit are shown below:

- Power transformer
- Choke coil
- Choke coil
- Special high capacity "A" power condenser
- Special high capacity "A" power condenser
- Special high capacity "A" power condenser
- Rectified unit
- A. C. line attachment cord
- Pendant switch cord
- Celoron front panel
- Base plate
- Condenser brackets
- Condenser clamp angles
- Box cover
- Special 8 point switch, knob and plate
- Receptacle for "B" eliminator
- Pendant switch
- Celoron connector strip, screws, nuts and bushings
- Output binding posts
- Rubber bushings
- Attachment plug and cap
- Flexible hook-up wire
- Terminals
- Rectifier cover
- Clamp screws
- Rectifier cover
- Transformer mounting screws and nuts
- Choke coil mounting screws and nuts
- Condenser bracket mounting screws and nuts
- Rectifier mounting screws and nuts

High Voltage Metallic Rectifiers

OWNERS of popular "B" eliminators as the Majestic, Thordarson R-71 Power Compact, and the large number of other makes employing gas type rectifiers shall no doubt be interested in a new means of rectification, as described in the present paper.

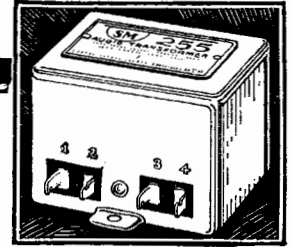
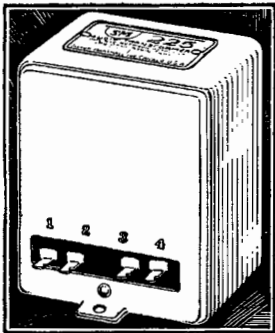
This new development was made possible by Dr. H. Shoemaker, of the Elkon Works, New York City, after many months research and experimentation on metallic (electronic) rectifier systems, of which he is a pioneer. While the underlying principles of contact rectification are perhaps not new still the pitfalls are many, and it is comparatively recent that a solution of the problem was made so that this method could be reliably adopted for such usage as battery charging; for the elimination of batteries for radio A power work; in telegraph, telephone and signal work, etc.—thus, metallic rectifiers were made dependable as a low voltage power source.

But where we deal with potentials in the order of 350 volts or more, then new problems arise. Further, any new means of high voltage rectification must be comparable in both rectified wave-

(Continued on page 114)

SM

We Think You Ought to Know—



TONE quality is elusive. We can prove, by laboratory measurements and curves, that the new Clough system audio transformers come closer to absolutely faithful reproduction than any others we have ever been able to find, at any price. That may prove nothing to you—but it's true, nevertheless. One by one, we are getting reports of tests—made by impartial engineers for manufacturers and others—agreeing with our own findings that *there is nothing on the market to match the tone quality of S-M Clough system audio transformers.* That's what the engineers in the world's largest telephone laboratories said. It's what the professors of an old New England engineering school decided.

To prove this to the public, here are the two fairest ways we know of—and we're taking both of them:

FIRST: We are building, and operating in the most public places we can find—the big radio shows, hotels, dealers' show rooms—*comparison amplifiers*, with switches to interchange instantly two sets of audio transformers in the same circuit. We are so well satisfied with the sales of S-M audios resulting from this "hard-boiled" method that we printed and distributed 35,000 copies of an article telling dealers and set-builders how to build such a "comparator". Do you know of any other transformer manufacturer who is doing that? If not, why is S-M the only one who is?

SECOND: We are guaranteeing absolutely that the S-M Clough-System transformers *large or small* cannot be surpassed by any of the conventional type not utilizing the Clough invention with its practical elimination of hysteretic distortion—at any price whatsoever.

If you have the equipment, by all means verify yourself the sweeping claims we make. If you haven't—then listen to one of the public S-M comparator tests. If you can't do that—try a pair. Ask your own ears! We think you ought to know.

S-M POWER TRANSFORMERS

Sure, silent, dependable power with ample reserve capacity—that is the story of S-M power transformers. There is a type for every need—whether it be to supply power for two 250-type super-power tubes or ABC power to an entire receiver. They have long been standard in popular power units because of their exact design and wide range of usefulness. The table below shows the different types, with at least one suited to every need.

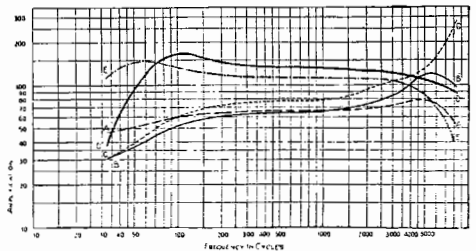
S-M Cat. No.	High Voltages	Filament Voltages	Price
327	250-250	7½, 7½, 2¼, 1½	\$15.00
327U*	250-250	7½, 7½, 2¼, 1½	15.00
328	550-550	7½, 7½	20.00
329	220-220	5 (center tap)	9.00
329U*	220-220	5 (center tap)	8.00
329BU*	220-220	5(ct), 5, 2¼, 1½	10.00
330	300-300	7½	9.00
331	Filter Choke—inductance	7½	8.00
331U*	30 henries at 110 m.a.		7.00

*Manufacturers' Type

S-M Unichokes, for power supply or speaker input use, combine 120 cycle selectivity and brute-force choking.

Record of Audio Transformer Tests

E is the two-stage curve for the large-size transformers (S-M 225, 1st stage; and 226, 2nd stage, \$9.00 each; D is that of the smaller ones (S-M 255 and 256, \$6.00 each). Note the marked advantage over A, B, and C—all standard eight and ten dollar transformers under equal conditions.



Are you receiving "The Radiobuilder" regularly? No. 5 shows how to build an amplifier for comparing audio transformers. No. 6 tells all about the new S-M Public Address Amplifier. To all Authorized S-M Service Stations, it comes free of charge; to others a nominal charge is made. Use the coupon.

If you build professionally, write us about the Service Station franchises. Or if you don't build, yet want your radio to be custom-made, S-M will gladly refer your inquiry to an Authorized Silver-Marshall Service Station near you.

SEVERAL of our cooperating distributors, whose announcements directly follow, join us in presenting a complete descriptive summary of the outstanding values to be found in the new S-M line.

SILVER-MARSHALL, Inc.
836 West Jackson Blvd., Chicago, U. S. A.

- Silver-Marshall, Inc.
836 W. Jackson Blvd., Chicago, U. S. A.
...Please send me, free, the complete S-M Catalog; also sample copy of The Radiobuilder
For enclosed.....in stamps, send me the following:
... (50¢) Next 12 issues of The Radiobuilder
... (\$1.00) Next 25 issues of The Radiobuilder
S-M DATA SHEETS as follows, at 2c each:
...No. 1. 670B, 670ABC Reservoir Power Units
...No. 2. 685 Public Address Unipac
...No. 3. 730, 731, 732 "Round-the-World" Short Wave Sets
...No. 4. 223, 225, 226, 255, 256, 251 Audio Transformers
...No. 5. 720 Screen Grid Six Receiver
...No. 6. 740 "Coast-to-Coast" Screen Grid Four
...No. 7. 675ABC High-Voltage Power Supply and 676 Dynamic Speaker Amplifier
...No. 8 Sargent-Rayment Seven
...No. 9 678FD Phonograph Amplifier

Name
Address



You'll Find It ALL in the 720

You'll want, this year, 10-kilocycle **SELECTIVITY**. That means the ability to tune in a weak, distant station on the channel adjoining that of a powerful local.

The S-M 720, in Chicago, gets KWKH (Shreveport, La., 760 kc.) through WBBM (Chicago, 770 kc., 5000 watts) for instance. Its ideal quality coils, perfect shielding, and precision tuning condensers enable it to produce such results consistently.

You'll want, this year, the **DISTANCE RANGE** you can't get without standard (D.C.) screen-grid tubes: many stations have had their power reduced, and your set must be that much more sensitive.

The S-M 720, even in poor weather for radio reception, brings in consistently, at Chicago, through the tremendous power of its three screen-grid r. f. stages, stations on the east, west, and gulf coasts.

You'll want, this year, the finest **TONE QUALITY** that up-to-the-minute inventions have only now made possible.

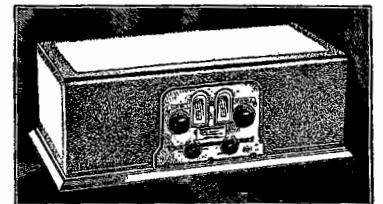
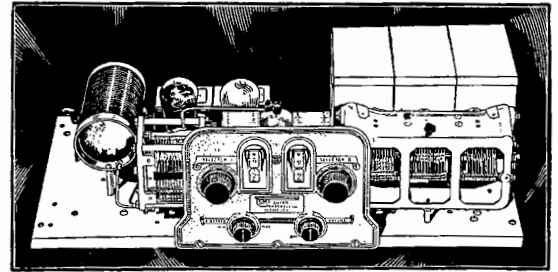
The S-M 720 is equipped with the new Clough system audio transformers—positively guaranteed superior to all others at any price. If you have heard the public tests made by S-M on simple comparison amplifiers, at the radio shows and elsewhere, you know how impossible it is to find their equal.

You'll want, this year, the **CLEAN, ACCURATE CONSTRUCTION**, with easy assembly and easy inspection, that denotes modern design and brings durability and reliable service. You'll want, this year, in any receiver kit you may buy, compactness and neat appearance at least equal to that of the best factory-built receivers.

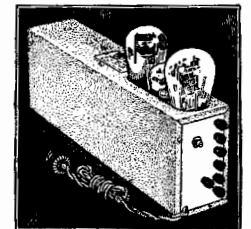
The S-M 720, when built on its metal chassis and mounted in 700 shielding cabinet, is thoroughly modern in every one of these respects.

You'll want, this year, in spite of all these improvements, the **LOWER PRICE** that quantity production of parts should make possible.

The S-M 720 kit, at \$72.50, is 15% lower in price, even, than the greatest bargain ever previously offered—the 630SG Shielded Grid Six. As compared with other kits of this season, irrespective of its superior quality throughout, it is "way below the market."



You get it all
in the
S-M 720
Screen Grid
Six —
Why
go further?



Now—Theatre Volume from any Phonograph at Low Cost!

Used with any dynamic speaker having 90 to 110 volt field coil—or with two dynamic speakers if desired, and supplying power for the field of one—the new S-M 678PD Phonograph Amplifier will take input from any phonograph magnetic pick-up—or from the detector of a radio receiver, using adapter plug—and boost it to the tremendous volume output of a 250 tube with the tone fidelity and freedom from hysteretic distortion provided only by S-M Clough-system audio transformers. For operation from any 105 to 120 volt, 50 to 60 cycle A.C. light socket. Tubes required: One UX281; one UX226; One UX250. Price of Complete Kit, \$66.00; wired \$73.00.

We Specialize in All S-M Parts and Kits

Every item in the S-M line, as well as other popular and high quality radio parts, can be shipped immediately from our tremendous stock. Get our catalog now. Best discounts to the trade.

**Mail the Coupon
Now!**

Wholesale Radio Service Company

A Service of Excellence to the Dealer

6 Church Street

New York City

WHOLESALE RADIO SERVICE CO.
6 Church Street, Dept. C-11
New York, N. Y.

Please send your new FREE catalog, listing a full line of S-M kits and parts, as well as all other standard brands of radio products for the setbuilder.

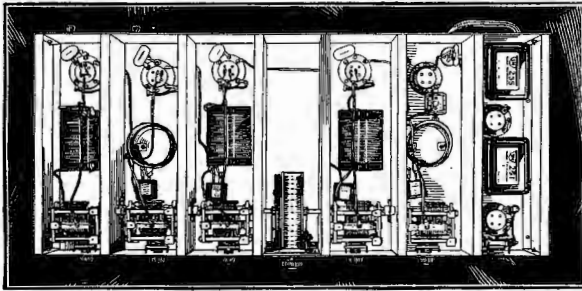
Name.....

Address.....

Town.....State.....



Build and Own The Boss of the Air



YOU wouldn't send a battleship to capture a beachcomber. You wouldn't use a naval gun to shoot quail, nor a 200-ton locomotive to haul a handcar, nor a tri-motored bombing plane to go half a mile.

Nor do we recommend the Sargent-Rayment Seven as a mere parlor decoration. With its single-dial control, it's not out of place in the finest of consoles—but in the New York, Chicago, and Los Angeles "congested districts" of broadcasting, the Sargent-Rayment is cutting through like a rocket—and proving itself beyond question *the boss of the air.*



Five sharply tuned circuits, all controlled by a single illuminated dial (with individual verniers in each stage for hair-line tuning) are here built to a standard of precision that brings out, to a degree never before approached, the marvelous possibilities in the new screen-grid tubes—four of which

are used. Tone quality is of the unequalled S-M Clough-system standard. The complete kit, exactly as authorized by the designers, comes with the heavy satin-finished aluminum shielding which builds up into the trim cabinet shown. Price, \$130.00. Custom-built and fully wired, \$175.00.

Super Power for Any Set at Moderate Cost

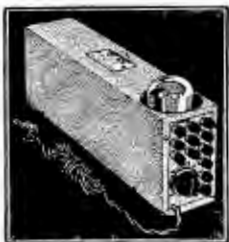
Consider well the power-tube equipment in any set you build. Progress is fast approaching the point where a radio receiver, to be strictly modern, must be capable of delivering to a dynamic speaker the full 4500 watts of undistorted output which represent the capacity of a 250-type power tube (as compared with 700 watts available from a 171-type).

Do you realize that, with the advent of the S-M 675ABC High-Voltage Power Supply, it is no longer either troublesome or expensive to provide this super-power in a receiver?

The 675ABC, mounted in its crackle-finished case only 3 3/16" thick, is ideal for use either inside or outside of a table-type cabinet or console. Using a 281-type rectifier tube, it supplies B power at 450 volts, with taps at 135, 90, 22, and (variable) 22-90. Plenty of filament current AC is available at 1.5, 2.25, and 7.5 volts. The price is only \$54.00 for the complete kit, or \$58.00 wired.

Setbuilders who require only 180 volts maximum will find the S-M 670B or 670ABC equally reliable.

Reservoir Power Supply Data



	Medium Voltage		High Voltage A, B & C
	B only	A, B & C	
Type Number.....	670B	670ABC	675ABC
B volts, maximum.....	180	180	450
Fixed voltages.....	135	135	135
	90	90	90
	22	22	22
Variable voltage.....	22-90	22-90	22-90
A volts (AC) available.....	1 1/2, 2 1/4, 5	1 1/2, 2 1/4, 5	1 1/2, 2 1/4, 5
Rectifier tube used.....	280	280	281
For power tube.....	171	171	210 or 250
Prices without tubes			
Complete Kit.....	\$40.50	\$43.00	\$54.00
Factory-Wired.....	43.50	46.00	58.00



We carry a full line of S-M Products—every kit or part mentioned in this section. Prompt service is assured. Maximum discounts to dealers. Send the coupon now.

Western Radio Mfg. Co.

"The Big Friendly Radio House"

128 W. Lake Street

Chicago, Illinois

WESTERN RADIO MFG. CO.
128 W. Lake St., Dept. C2
Chicago, Ill.

Please send at once your new FREE catalog, listing S-M parts and kits as well as many other highest-quality radio products.

Name.....

Address.....

Town and State.....



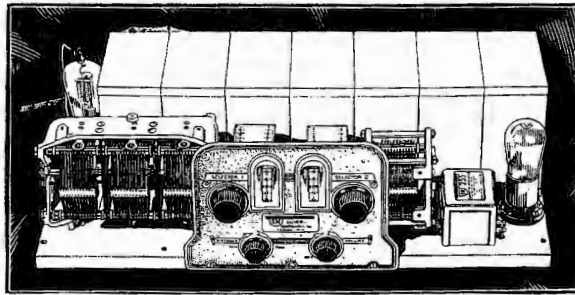
Build the Leader

of all designs for custom building
The 1929 Screen Grid Laboratory Super

THEY come and go—alleged world-beaters of every description. Yet two facts stand out to any practiced observer who has watched the rapid progress in improvement of radio reception:

First: The supremacy of the super-heterodyne principle remains as secure as ever. Nothing can approach it where results count first.

Second: For the last four years the improvement in super-heterodyne practice which have kept that circuit in the lead in spite of constant improvement in other types, have been pioneered in practically every case by the series known as the "Laboratory Receivers." First the all-wave feature—then the first "shielded" super for home construction—then the unit amplifier catacomb—



all carefully copied by imitators as the Laboratory Receiver marched on to new improvements.

For 1929 the Nine-Tube "Lab Super" has three screen-grid t.r.f. stages, ahead of a 65 kc. screen-grid amplifier—it gives 10 kc. sharpness, one-spot convenience, and Clough-audio-system tone quality. We offer a complete kit of parts, exactly as specified by the designer; the price is only \$95.20. S-M 700 two-tone brown metal shielding cabinet, \$9.25 additional.

If you wish to know what will be the most-talked of features six months from now—it's a safe bet—look now at the 1929 Laboratory Super-heterodyne. The coupon below will bring complete description and directions for building—without charge. Send it now.

Famous S-M Unipac Power Amplifiers



A big, rugged, 680-type Unipac, with a radio receiver or phonograph, means plenty of volume for a party or dance in the home—or for the club or lodge hall. And real tone fidelity—well, S-M transformers always assure that.

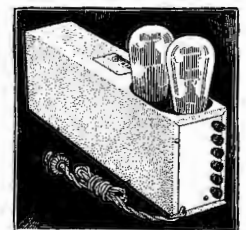
Unipac Power Amplifier Data—All Prices Less Tubes

	1 Stage		2 Stage		3 Stage Public Address
	Straight Audio	Push-Pull	Straight Audio	Push-Pull	
Type No.....	681-250	681-210	682-250	682-210	685
B voltages supplied to receiver.....	45	45	45	45	.....
	90	90	90	90	.....
	135	135	135	135	.....
A voltages supplied for AC tubes.....	.....	.....	1 1/2, 2 1/4	1 1/2, 2 1/4	.....
Tubes in last stage.....	1-250 or 210	2-250 or 210	1-250 or 210	2-250 or 210	1-250
Tube in first stage.....	.....	.....	226	226	227
Tube, intermed. stage.....	.....	.....	.....	.....	226
Rectifier tubes.....	2-281	2-281	2-281	2-281	2-281
Voltage regulator tube.....	874	874	874	874	.....
Price, complete KIT.....	\$81.50	\$ 87.00	\$ 96.50	\$102.00	\$125.00
Price, WIRED.....	96.50	102.00	111.50	117.00	160.00

New!

676 Dynamic Speaker Amplifier

This is a single stage power amplifier especially for use as a third stage, after any radio set, to boost volume and tone to give extra fine results with standard dynamic loud speakers. It uses one UX281 rectifier and one UX250 super-power amplifier, and has binding posts for receiver output connections, loud-speaker cord tips, and also for the dynamic speaker field. The 676 Amplifier operates any dynamic speakers having a 90 to 120 volt DC field, to which it supplies necessary power. Added to any set equipped with a dynamics speaker, it will provide a marvelous improvement in tone and volume. Price, 676 WIRED, \$55.00; or 676 in KIT form, \$49.00.



We are National Distributors of S-M Products

We carry for your convenience a complete line of S-M Radio Parts and Kits, including all the new Clough audio transformers. Any of these can be shipped at once, as well as the new Unipacs, power supplies, audio transformers, and other parts. Our new catalog will be a revelation to you—use the coupon and get it now! LIBERAL DISCOUNTS TO THE TRADE.

Quick,
Courteous
Service

Setbuilders Supply Co.

103 Romberg Building Chicago

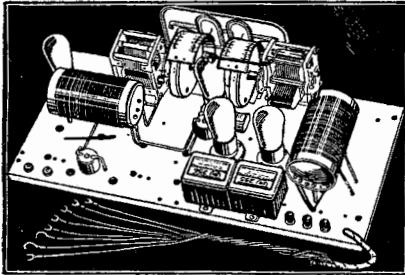
SETBUILDERS SUPPLY CO.
103 Romberg Bldg., Chicago, Ill.

Send me at once, FREE, complete instructions for building the 1929 "Lab. Super" also your big new 100 Page Wholesale Catalog listing S-M and other radio parts, cabinets, consoles, and accessories of highest quality.

Name.....
Address.....
City..... State.....

SM

**\$150
Reception**



**at a
\$50
Price**

TO the thousands of fans for whom the four tube, R.F. amplifier, regenerative detector and two stage audio amplifier is the time-tested standard of receiver comparison, the new Silver-Marshall Coast-to-Coast Four offers the finest performance yet attained with this remarkable circuit. A screen grid R.F. amplifier stage, immeasurably finer coils than ever before, the new Clough high-gain audio system, and an all-metal assembly like those of the finest of ready-made sets, make the "740" the biggest \$51.00 worth of radio set you've ever listened to.

The Coast-to-Coast Four, at Chicago, plays on the speaker New York, Florida, Texas, and California stations, cutting through local Chicago interference only 10 or 20 kc. away. Its tone quality is such as only S-M transformers can provide. Housed, like the 720 six, in the new S-M 700 table-model metal shielding cabinet, it harmonizes beautifully with any home furnishings.

Despite this demonstrated superiority, in every respect, over all other sets in its price class against which we have tested the 740, the complete kit of all approved parts costs but \$51.00; or the 740AC kit, \$53.00 complete. The 700 cabinet is \$9.25 additional or is included with 740 wired, \$75.00; and 740AC wired, \$78.00.

We go emphatically on record that no matter what set you build or buy, the 740 Coast-to-Coast Four is the best dollar for dollar value you can find around fifty dollars. It goes together easily and simply, performs with a vengeance, and for the professional setbuilder provides a low-priced set that will out-demonstrate ready-made sets at twice its price.

CLARK & TILSON

122 Chambers St. New York, N. Y.

CLARK & TILSON,
122 Chambers St., New York, N. Y.

Please mail your catalog showing S-M parts and kits, and other high quality radio apparatus, as advertised in November Citizens Call Book.

Name.....

Address.....

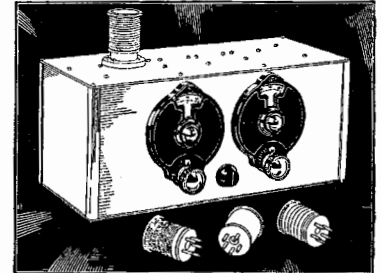
S-M Parts Always in Stock

We always have a large stock of S-M kits and parts, as well as other high quality apparatus. Send the coupon for our catalog. Discounts to dealers. Try us for quick service.

SM

**S-M for Results
Graymore
for Service**

**Hear London's Big Ben
Chime
in Your
Home!**



NOT with any ordinary radio receiver, of course—the Atlantic is too wide for regular broadcast receivers to bring you London programs. But an S-M "Round-the-World" short-wave set will do just that—quite regularly. Turn yours on, some night. Don't be surprised if the language you hear is a foreign one, or if the announcer mentions "Paris" or "Amsterdam," or "London" instead of the cities you are accustomed to hear from. Call your neighbors to listen if you want to—but be cautious about calling anyone who has already explored the mysterious short-wave channels with an S-M set—your wonders might sound very tame to him. Perhaps by this time he is only interested in New Zealand and Japan! For in short-waves almost anything is possible; amazing feats of distant reception are becoming a matter of common knowledge.

S-M 730 "Round-the-World" complete 4-tube set, with aluminum cabinet; factory-wired, \$66, or in kit form \$51.

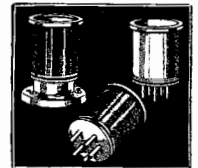
S-M 731 "Round-the-World" 2-tube adapter with same cabinet (converts any broadcast-band set for short-waves) also comes factory-wired, \$46, or kit \$36.

S-M 732 Essential Kit \$16.50.

S-M 5-Prong Midget Plug-In Coils

The new S-M coils for short and broadcast waves. Wound on forms of threaded moulded bakelite.

You can use your Round-the-World Four on broadcast bands with these new coils—131X for 190-350 meters, \$1.25; 131Y for 360-650 meters, \$1.50.



Headquarters for S-M Parts

We are Silver-Marshall's oldest jobbers in New York and can fill promptly your mail orders for S-M, as well as for other high quality merchandise. Send coupon for our new catalog. Discounts to dealers.

GRAYMORE RADIO CORP.

142 Liberty St. New York, N. Y.

GRAYMORE RADIO CORPORATION,
142 Liberty Street, New York, N. Y.

Please mail your new catalog of quality parts and kits, as advertised in Citizens Radio Call Book for November.

Name.....

Address.....

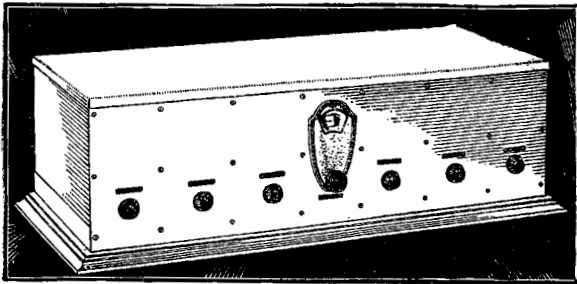
SM INSIDE STUFF

On Reception Where Conditions Are Worst!

F. W. McDonell, a New York City consulting radio engineer, says:

The first day of the snow. We had over 300 people visit us since, but we have had enough to keep us jumping around the place hot-foot.
 You will be interested in a word of comment on the Silver-Marshall 710 set. I want to put myself on record right now as saying that it is without question the best receiving set of any type or description that we have ever demonstrated here in New York. During the evening demonstrations, we were able to tune in at all almost anything in the country that we desired, getting such stations as Fort Worth, Atlantic City, Atlanta, Ga. and literally hosts of others, with as much volume as any ordinary receiving set receives WAF in this locality. It has been a splendid thing for us to be able to demonstrate the Silver-Marshall under such conditions as these, particularly when you consider that our receiving conditions here are most abominable.
 Now, regarding the Silver-Marshall 720 which you see before you, I say...

Price of Complete Approved Kit, with Special Aluminum Cabinet, \$130.00.



OUR BIG MAIL ORDER DEPARTMENT specializes in quick service on all S-M parts and kits, and other high quality radio merchandise. Send the coupon below for our new catalog. Liberal discounts to dealers and setbuilders.

Royal Eastern Electrical Supply Company

16 West 22nd Street New York, N. Y.

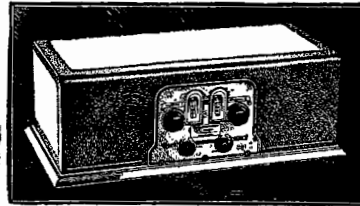
ROYAL EASTERN ELECTRICAL SUPPLY CO., Dept. CB-11, 16 East 22nd St., New York, N. Y.

Please send me free, your latest catalog of radio apparatus, containing full description of the complete S-M line, as well as other leading lines of receivers, accessories, kits and parts.

Name.....

Address.....

SM A Beauty —Yes— and Watch It Step



THERE'S nothing of that tinkering look about the S-M 720. It might be, for the neat, modest appearance of its two-tone brown moire cabinet, any one of the higher-grade "beauty" radio sets. Even when you hear it (on some "easy to get" station) you may not notice at once its rare reproduction—unless a symphonic program should present some of the more difficult tonal values that show the "720" up for the finest of tone quality. But—leave for a moment the beaten paths of the air. Turn to a "vacant" channel. Or better yet—a wave-length ordinarily clogged by heavy local interference. Turn up that "distance" knob—and watch that gang of three screen-grid R.F. tubes get into action. Listen to a voice you never heard before! Do it again, and again, on other dial points.

Then you'll never ask again, "Why people have custom-built radios"—nor be content with any performance less than that of a genuine custom-built S-M 720 Screen-Grid Six.

Eastern Mail Order and Wholesale Distributors

Specializing on—

- S-M 710 Sargent-Rayment Seven Kit, \$130.00
 - S-M 720 Screen-Grid Six Kit, \$72.50
 - S-M 730 Round the World Four Kit, \$51.00
 - S-M 740 Coast to Coast Four Kit, \$51.00
 - S-M 740AC Coast to Coast Four Kit, \$53.00
 - S-M Power Equipment
- Our large stocks mean quick service on S-M kits and parts as well as all other standard high quality radio merchandise. We can fill all your requirements quickly and satisfactorily.

DEALERS and SETBUILDERS: Send the coupon to the largest S-M New England Distributor for maximum discounts and literature—or send your order to be shipped C. O. D. at the very best trade discount.

H. JAPPE COMPANY

46 Cornhill Boston, Mass.

H. JAPPE COMPANY, 46 Cornhill, Boston, Mass.

Please send your literature and best discounts on all S-M parts, kits and power equipment, as well as all other standard radio supplies, as advertised in Citizens Radio Call Book for November.

Name.....

Address.....



SM

Official Wholesale Distributors

Get Your Silver-Marshall Parts from W. C. Braun Company



We are official wholesale distributors for all Silver-Marshall products—parts, kits, circuits, etc. A complete stock of S-M parts is on hand for immediate shipment to fill dealers' requirements anywhere.

EVERYTHING IN RADIO

We carry the largest and most carefully selected line of radio goods in the country—the lines of the leading manufacturers of sets, parts, kits and accessories. Mail orders given special attention. We are fully equipped to serve dealers on mail orders promptly and efficiently. Our new dealers' catalog lists over 4000 items in radio, electrical goods, sporting goods, auto supplies and allied lines that keep the dealers' business humming twelve months of the year.

Write for free copy of this catalog on your letterhead and learn about our successful dealer plan.

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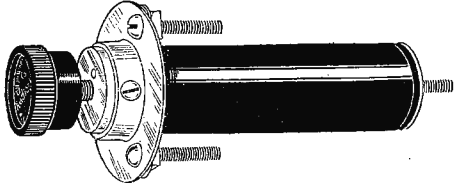
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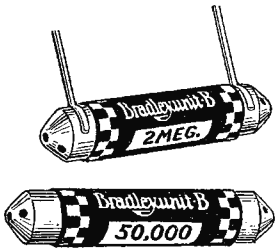
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A reliable filament control rheostat for supply transformers of 500 watts or less. A uniform stepless variation of resistance, caused by pressure exerted on a column of specially treated discs, provides extreme fineness of control. This remarkable Radiostat is unaffected by moisture or weather conditions, and will not deteriorate in service. Used for controlling speed of scanning disc motors in television equipment.

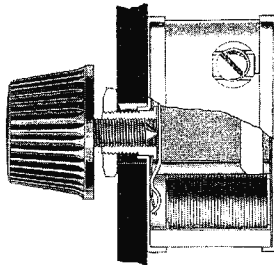
Bradleyunit-B



A solid-molded fixed resistor that will not cause noise interference in radio amplifier circuits. Its remarkable stability of resistance, regardless of voltage used, assures perfect and quiet operation at all times. Unaffected by weather conditions. Furnished with or without soldering leads in values from 500 ohms to 10 megohms. Especially adapted for amplifiers used in experimental television equipment.

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This reliable graphite compression rheostat provides accurate stepless control for many radio uses. Because of its wide range and unusual stability of resistance, the Bradleyohm is ideal for plate voltage control. Made in a large variety of sizes providing widely varying resistance values. It will not deteriorate in service.



ALLEN-BRADLEY CO., 488 Clinton Street, Milwaukee, Wis.

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Perfect Radio Devices

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(Continued from page 105)

form with freedom from harmonic, and finally develop a uniform flow of rectified current for the tube plate circuits of a receiver at least the equivalent of that produced by modern high vacuum filament type rectifiers, or to a lesser extent gaseous conduction varieties. It was solution of such problems which Dr. Shoemaker undertook, and finally mastered.

The resulting device known as the new Elkon type EBH metallic rectifier is the first of a series of high voltage units to be manufactured, being designed for the complete elimination of both present day gaseous and high vacuum filament type tubes such as the popular BH, 280, 281, etc.

The device about to be described has been designed essentially as a replacement unit for gas type rectifiers such as the BH class of tubes employed in Majestic, Thordarson R-171, or similar types of socket power apparatus. And in view of its radical departure from accustomed forms of rectifiers analysis of its characteristics reveals that the new development clearly points out metallic or electronic rectifiers permit rectification of currents and voltages of relatively large amplitude, being in every way at least the equivalent of thermionic types of like power.

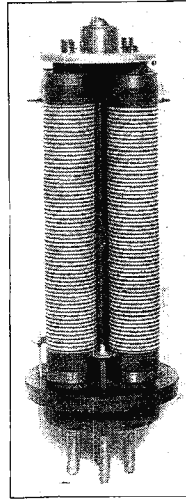


Fig. 3. The inside of the new Elkon E. B. H. metallic high voltage rectifier is shown above

The photograph, Fig. 3, depicts the new Elkon EBH rectifier in assembled and partially complete forms. Outwardly it has all the appearances of a screened grid tube shield. It is 5 7/8 inches in height, has a diameter of 1 3/4 inches and weighs approximately 16 ounces. Employing a standard tube base permits its adoption in the same way as any ordinary tube.

The photograph reveals its internal construction to differ radically from all other forms of rectifiers. Since the unit is very nearly all metal and contains no glass envelope or supporting structure it is obvious little or no damage can come to it. The outer extruded aluminum casing serves essentially as a heat radiator, and completes an assembly pleasing to the eye.

As shown in the photo, the actual rectifiers consist of a large number of couples made up of cupric sulphide in contact with an aluminum-magnesium combination. These coupling elements have all the appearances of a large number of washers, and are 9/16 inch in diameter. In proper combination they are assembled into four stacks, and then by means of clamping collars are formed together hydraulically to a predetermined pressure. The four main sub-assemblies are then inter-connected so as to electrically fit the circuit for which the rectifier is intended; thus the base-plug permits supplying the high voltage raw alternating current to the coupling units, and finally for taking off the rectified full-wave D.D. output component.

The process of couple manufacture, treatment and aging, around which the device evolves, makes a story in itself, but space does not permit a lengthy description. In the complete assembly two hundred and forty couples are employed; and since the maximum impressed voltage per anode is 350 R.M.S., it is evident that the couples are designed for a potential pressure of approximately 3 volts R.M.S. per pair of couples.

Principle of Operation

The operation of the EBH rectifier is based upon the physical fact that when relatively high electro-positive and electro-negative bodies are brought into proper contact and current passed so that an electro-mechanical reaction takes place at their junction, an asymmetrically conducting film is formed at the junction which permits the passage of current in one direction only. These films can be formed and continuously maintained when proper elec-

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A popular walnut Hi-Boy Console, with drop-leaf desk. Beautiful two-tone finish. Rare bargain!

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At right, a Lo-Boy console, walnut finish, that costs little. A gem!

Above, popular inexpensive combination. Set on Table Speaker (sold separately).

Metal or wood compact style cabinets. Wood cabinets in walnut or new shaded silver-chrome finishes. Cathedral Electro-Dynamic or Magnetic-Power Speaker to match!

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Celebrating its 9th successful year, America's big, old, reliable Radio Corporation springs a genuine sensation in high-grade sets. With its latest, Super-powered, 1-dial features, including hum-free operation, tremendous "kick" on distant stations and razor-edge selectivity—with its costly sturdy construction, latest features, including phonograph pick-up connection, ease of tuning, beauty, and economy—a Miraco will make you the envy of many whose radios cost 2 to 3 times as much!

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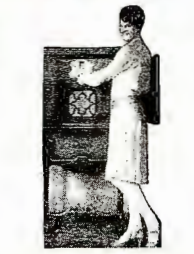
Only exceptionally fine radios, of the very latest approved type, at rock-bottom prices, could possibly back up so liberally unconditional a guarantee. Send coupon now for *Amazing Special Factory Offer!*

Many thousands of Miracos—bought after 30 day home comparisons—are cutting through locals and getting coast to coast with the tone and power of costly sets, their delighted users report. Miracos are laboratory-built with finest parts, and embody 9 years' actual experience in constructing fine sets. Approved by Radio's highest authorities.

Deal Direct with Big Factory

Everything reaches you splendidly packed and rigidly tested to insure your instant enthusiasm. Enjoy the outfit 30 days—then decide. Liberal 3-year guarantee on each set. Play safe, save lots of money, and insure satisfaction by dealing direct with Radio's old, reliable builders of fine sets—9th successful year.

Don't Confuse with Cheap Radios
With its rich, clear Cathedral tone, **Miraco Outperforms 'em All In Chicago**
On the Miraco Unitone, to start with, will say: I got to date 61 stations outside of Chicago, from the Pacific Ocean to the Atlantic Ocean, and from Anchorage, Alaska, to the Gulf of Mexico, and I tried the set with 3 different antennas. That is an outside aerial 152 feet, an inside aerial 20 feet, and



AC-8—\$71.50

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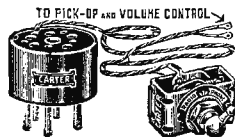
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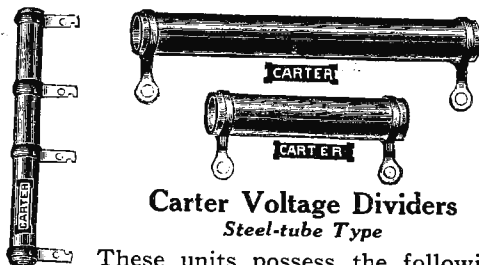
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For standard loud-speaker cord tip terminals. Mounts in $\frac{1}{4}$ in. hole on panels up to $\frac{3}{16}$ in. thick. Heads are coded for easy identification in the following colors: Silver, Red and Black.



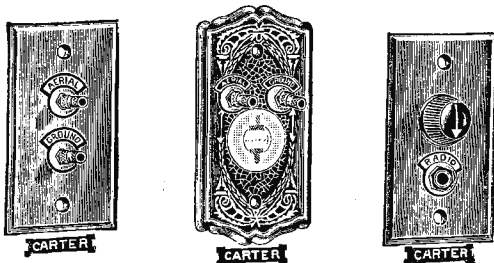
Carter Radio-Phono Attachment

Makes it simple to reproduce phonograph records through your radio set. No wiring changes necessary. Supplied in two types (for four prong or five prong tubes).



Carter Voltage Dividers Steel-tube Type

These units possess the following advantages: Low operating temperature, exact in rating, non-breakable (the base is a steel tube). They are not likely to burn out on overload. Produced in standard sizes.



Carter Radio Outlet Plates

Carter plates are made in sixteen different styles and combinations to meet all usual installation requirements. Specified and used by modern architects and contractors. Write for our attractive booklet. It carries many practical suggestions on how to use these conveniences to advantage.

"The Majority's Choice"



trical and physical conditions prevail at the junction.

To insure continuity of conditions in this type of rectifier, the electrode bodies are held tightly in close contact under a relatively high pressure by suitable means.

Superior operating characteristics are obtained in the type of rectifier under discussion by the use of magnesium as the electro-positive electrode body and cupric sulphide at the electro-negative electrode body.

When a disc of cupric sulphide is held under sufficient pressure in contact with a disc of magnesium and an a. c. voltage of proper magnitude applied across the junction, the film which imparts rectifying characteristics is formed generally during the

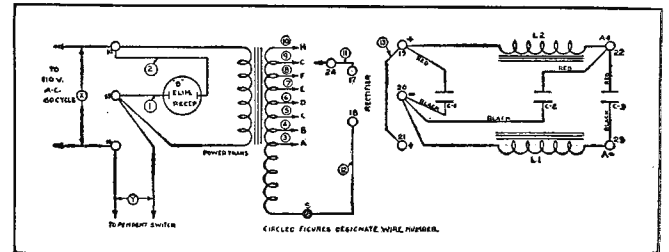


Fig. 4. The schematic circuit covering the use of the metallic rectifier is here given

first cycle, after which rectified current will pass from the cupric disc to the magnesium disc. Cupric sulphide discs in these rectifiers are formed to have the proper physical structure as well as proper chemical composition. The surface of the electro-positive body is also treated so as to insure highly uniform operating characteristics.

When the couples, comprising discs of cupric sulphide and magnesium, are held together by a pressure which insures substantially uniform contact throughout the junction the current blocking film which is formed is observed to unite the electrode discs as though they were fused together, forming a continuous conductor which has a relatively high resistance to the passage of current from the magnesium to the cupric sulphide disc and a relatively low resistance to the passage of cupric sulphide to the magnesium disc.

Full Wave Rectification

Figure 4 shows an elementary circuit for producing full wave rectification. It will be seen from the figure that two rectifier junctions, or two series of junctions, are used in series with each other and in series with a transformer secondary, which delivers the required voltage. It will also be seen that the load resistance R or combination of plate circuit demanded by the radio receiving set, as the case may be, is connected from the center of the transformer secondary to a point in the circuit between the two rectifier junctions. The transformer used in this type of circuit is called a center-tapped transformer. This circuit is, in fact, a combination of two half-wave rectifiers and each section of the transformer secondary must give sufficient voltage to force the required current through the load resistance.

Practical Results in B Eliminator Circuits

In actual practice the new Elkon EBH rectifiers merely replace existing BH gas types without making a single circuit change.

Dongan Power Supply Unit

In the accompanying article is shown the method whereby the Dongan power transformers, chokes and condensers may be used in the construction of a plate power supply using two 281 rectifier tubes. The voltage divider system is made by Electrad and comprises one of the Truvolt Dividers and a fixed Truvolt resistance.

The design of the unit is quite simple and in view of the fact that all of the wire from the Dongan transformers, chokes and

a SUPREME will make money for you

THE Supreme is the only instrument in the world that makes oscillation tests on all radio tubes. This is the only accurate method of finding the actual value of a tube. The Supreme shows by meter readings the exact working condition of any tube from 1½ to 15 volts, including screen grid, heater type, and rectifier tubes. It is the only known instrument that shows output of rectifier tubes.

The Supreme self-contained power plant, deriving its power direct from any A.C. line, makes the oscillation tests possible. Every radio engineer and service man will appreciate this exclusive Supreme feature.

The Supreme radiator sends out a modulated wave. Simply plug into A.C. line. No more wasting valuable time waiting on broadcast stations; always at your service and finer adjustment assured.

The Supreme heavy duty rejuvenator provides scientific method of rejuvenation of any thoriated filament tube. Will reactivate up to 12 tubes at one time without removal from set. Pull a plug—the Supreme does the rest.

Condensers can be balanced or synchronized—not by the former tedious methods—but with both meter reading and audible click. Easy, and much more accurate.

All continuity tests can be made from socket on either A.C. or D.C. sets. The Supreme will give direct reading amplifying power of tubes and will show actual working condition of all tubes.

It will give plate voltage readings with or without load; will test voltage and current of all radios, including those using the latest tubes such as 210 and 250; will give grid circuit readings up to 100 volts; will test output of trickle chargers, or any output up to 2½ amps.

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Marvelous as is the Supreme, it is extremely simple. Plainly marked push buttons provide for instant selection of all meter scales. It is as simple as it is thorough; as rapid as it is accurate.

Three Weston meters, mounted in Bakelite cases, are built in both models:

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- 1 A.C. Voltmeter, three large scales of 0/3/15/150.

Every competent radiotrician knows that this meter equipment insures maximum accuracy.

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Use the Supreme in your service work. One man does the work of three and does it more accurately and easily, because it substitutes scientific analysis for guess-work.

Put the Supreme to work; you'll find it the biggest money-maker on your pay-roll.

Send No Money

We don't want you to buy the Supreme until you have convinced yourself that it is all we say it is; until you have actually tried and tested it in your daily work! We want you to use it in your business for six days before you buy!

Order the Supreme that best suits your needs, by signing the coupon below. When it arrives, DEPOSIT with your express agent either the cash price or DEPOSIT the down

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A Complete Set-Tester

Model 99A

The ideal instrument for the busy service man. Light in weight, compact, accurate, thorough, and complete. Comes in a well-constructed, leather grained, brass bound traveling case with compartment for tools, etc. All necessary adapters and accessories furnished.

Only \$28.50 cash and 8 trade acceptances for \$10.00 each, due monthly. Cash price, \$97.65.

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A complete portable laboratory: comparable in results and efficiency with the most expensive stationary laboratory equipment. An instrument worthy of the most skilled radio engineer, and still so simple that the average serviceman can obtain perfect results easily and quickly.

Comes in a handsome, brass bound traveling case, which is complete and convenient in its appointments. Contains a swinging tube shelf providing absolute protection and instant accessibility to tubes. Has adequate and easily accessible compartments for all tools, accessories and supplies. Complete set of tools and materials, from electric soldering iron to screw-driver, is furnished, each located in its proper place in the case.

Instrument lifts out of traveling case for store or laboratory use. The 400A will play radios with open transformers and will give condenser, choke coil output, and capacity outputs on radios not wired for the purpose.

Access is provided to all apparatus through pin-jacks. Will test condensers for breakdown. Contains various fixed condensers from .001 to 2 mfd., a 30 ohm rheostat, a 500,000 ohm variable resistance, and an audio transformer, for instant use and various combinations.

Only \$38.50 cash and 10 trade acceptances for \$10.00 each, due monthly. Cash price, \$124.65.

The most thorough, convenient, and practical apparatus in the radio field.

Request for 6 Day Trial

Department CB-1 Date.....
SUPREME INSTRUMENTS CORP.
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Please ship me the Supreme Instrument I have checked below. Upon delivery of the instrument I will deposit with the express agent either the cash price OR I will deposit the down payment and sign trade acceptances (installment notes) on the basis of the following prices and terms:

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- Supreme Set Tester, No. 99A—Price \$28.50 down and eight trade acceptances (installment notes) for \$10.00 each, due monthly. Cash price, \$97.65.

It is agreed that the deposit made with the express agent shall be retained by him for six days. If, within that time, after testing the instrument I am not entirely satisfied, I have the privilege of returning the instrument to the express agent in good condition with the seal unbroken (see note below) and all tools and parts intact. Upon such return and upon the prepayment of return express charges, the deposit I have made with the express agent will be promptly returned to me.

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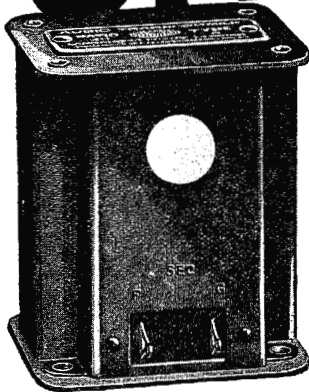
Please include three or more trade references, including at least one banker, with this coupon.

NOTE: The seal on the panel of the instrument covers the master screw in the assembly. It is never necessary to disturb this and it does not in any way prevent or restrict the use of the instrument.



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Now Sangamo Audio Apparatus at low cost! You can easily bring your set up to date by building a modern amplifier with these parts at little expense.

Type "AX" Audio Transformer

Has an extremely flat amplification curve at all audio frequencies.

Price, each.....\$6.00

Type "BX" Push-Pull Input Transformer. Has extremely high primary inductance, insuring maximum amplification at low frequencies. The secondary is accurately divided to secure practical identical frequency characteristics.

Price, each.....\$6.50

Type "CX-171" Push-Pull Output Transformer. The impedance of this transformer is designed to match UX-171 and CX-371 and UX-250 and CX-350 power tubes.

Price, each.....\$6.50

Type "DX-210" Push-Pull Output Transformer. Impedance matches UX-210, CX-310, UX-112 or CX-112 power tubes.

Price, each.....\$6.50

For Push-Pull Amplifiers Used with Dynamic Speakers

Due to the greater output of the modern receiver, many manufacturers are improving quality of reception by using speakers with a separately energized field. A push-pull amplifier using the type "BX" Input Transformer and one of the Output Transformers listed below in conjunction with a dynamic speaker is the last word in audio reproduction.

Type "GX-210" Output Transformer. Especially designed for push-pull amplifier using UX-210 or CX-310 tubes in conjunction with dynamic speaker.

Price, each.....\$6.50

Type "HX-171" Output Transformer. For amplifier using UX-171 or CX-371 and UX-250 or CX-350 tubes with dynamic speaker.

Price, each.....\$6.50

Send for free circular giving latest audio hook-ups

SANGAMO ELECTRIC COMPANY

Springfield, Illinois

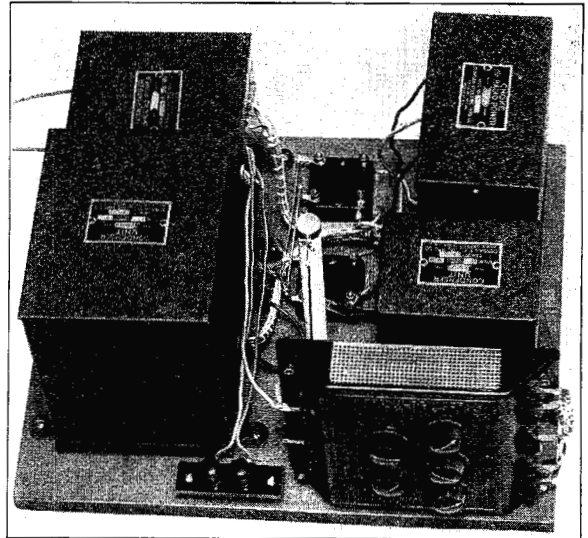


Fig. 5. This compact power supply makes use of parts manufactured by Dongan and utilizes an Electrad Truvolt divider for the resistance net work

filter blocks are brought out in flexible leads, it is possible for the professional set builder to put the power supply together in a very short time.

The schematic circuit shown in Fig. 6 will enable any professional set builder to make all necessary connections for the construction of the power supply. The photograph in Fig. 5 shows the final job after it has been wired. All of the Dongan material is enclosed in metal housing, these acting as a shield and also as a means of compacting and simplifying the layout of the power supply.

Parts Required

Parts required for the construction of this power supply are as follows:

- 1 Dongan No. 1569 power transformer
- 1 Dongan No. 550 audio filter choke
- 1 Dongan No. D-60 filter condenser block
- 1 Dongan D-30 bypass condenser block
- 1 Electrad Truvolt Divider
- 1 Electrad Truvolt fixed resistance
- 2 Frost UX sockets
- 2 X-L bakelite binding posts
- 2 Ceco or Sonatron 281 rectifier tubes
- 1 Package Corwico Braidite hook-up wire

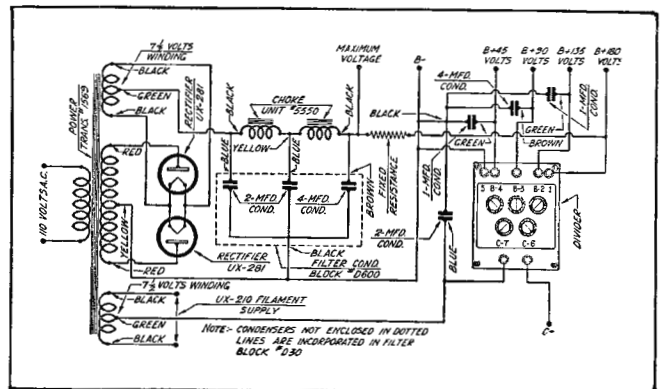
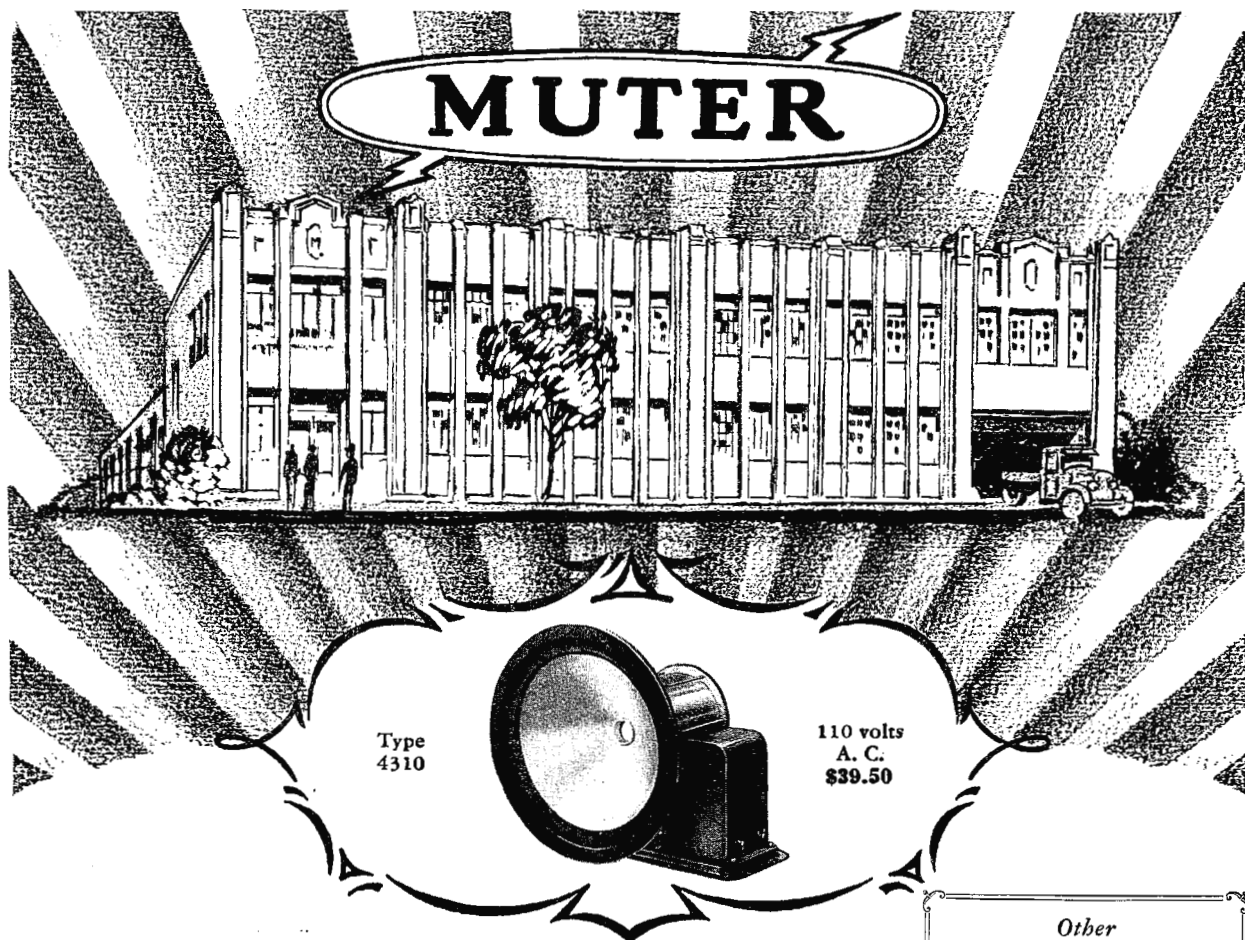


Fig. 6. This schematic circuit shows how the Dongan power supply is wired together, including the Truvolt Divider



Muter Dependable Dynamic Type Speaker

THE Dynamic Speaker with its superlative performance is this season's outstanding radio sensation. It has changed the radio set from a mechanical reproducer of sounds to a musical instrument supreme. The distinctive tone of the various new manufactured receivers can be attributed almost entirely to the Dynamic Speaker, and this same improvement can be embodied in any set by the attachment of a Muter Dependable Dynamic.

Dependable Dynamic Speaker Unit

Power	Type	Price
6 volts D. C.	4306	\$29.50
90 volts D. C.	4390	33.00
110 volts A. C.	4310	39.50

Table Model in Solid Walnut Cabinet

Power	Type	Price
6 volts D. C.	4406	\$49.50
90 volts D. C.	4490	53.00
110 volts A. C.	4410	59.50

Spinnet Console Model of Solid Walnut

Power	Type	Price
6 volts D. C.	4506	\$64.50
90 volts D. C.	4590	68.00
110 volts A. C.	4510	74.50

LESLIE F. MUTER COMPANY

8442 South Chicago Avenue / / Chicago

Other MUTER DEPENDABLE Products

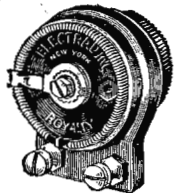
- Dynamic Speakers
- By-Pass Condensers
- Filter Condensers
- Fixed Condensers
- Rheostats
- Tubestats
- "B" Eliminators
- Resistance Amplifiers
- Phone Plugs
- Antenna Kits
- Lead in Insulators
- Panel Switches
- Knife Switches
- Ground Clamps
- Interference Eliminators
- Clarifier and Tone Filter
- Soldering Lugs
- A. C. Power Units
- Neutralizing Condensers
- Trimming Condensers
- Audio Transformers
- "B" Power Unit Trans-formers
- Choke Coils—A.F. and R.F.
- Grid Leaks
- Power Resistances (tapped and variable)
- Antenna Plugs
- Lightning Arresters and many others.

The Complete Quality
Popular Priced Line

Quality Tells!

Manufacturers of the finest receiving sets and eliminators use Electrad Resistance Controls. Engineers and technicians specify them exclusively. Only controls of perfected designs and proven performance could enjoy such universal endorsement.

For the same reasons that leading authorities use and specify Electrad Controls, builders of sets and eliminators should insist on these time-proven resistances.



ROYALTY Variable High Resistances

Excl. Lic. by Technidyne Corp.
U. S. Pats. 1593658, 1034103, 1034104

Entirely free from harmful inductance and capacity effects. Widely recommended wherever a unit of this type is required in the circuit. Types covering every purpose. Potentiometer types \$2.00. All others \$1.50.

TRUVOLT ALL WIRE RESISTANCES

U. S. Pat. 1,676,869
and Pats. Pending

The unique, air-cooled construction of Truvolts makes for unusual accuracy and permits carrying heavy current loads with a high factor of safety. Truvolt Variables simplify B-Eliminator construction by eliminating difficult calculation and making all adjustments easy. 22 stock types, \$3.50 each. Truvolt Fixed Resistances are adjustable to different set values by the use of sliding clip taps—an exclusive Truvolt feature! Made in all desirable resistance values and current ratings. Electrad specializes in a full line of resistance controls for all radio purposes, including Television.

Tear out and mail coupon

----- CUT HERE -----

ELECTRAD, Inc.
Dept. E-11, 175 Varick Street, New York
Please send me descriptive circulars on the following products and put me on your mailing list for similar literature.

.....General Circular;Tonatrol Volume Controls;Phasatrols;Royalty Variable Resistors;Truvolt Divider;“Electrad Control Manual;”“What B Eliminator Shall I Build?” (Enclose 10c for mailing.)

I am particularly interested in.....

Name.....

Address.....

ELECTRAD

Bryden Dynamic Kit

DYNAMIC speakers have attracted such widespread attention on the part of the public, that professional set builders and experimenters are now desirous of building their own from a kit. In this connection, it is interesting to note that the Bryden Products, Inc., of Detroit, have recently begun the marketing of their Bryden dynamic speaker kit, one of these dynamics having recently been assembled by our technical staff with excellent results. The completed unit is shown in the illustration, Fig. 7, on this page. The unit is neat, trim and efficient. It is of the 110 volt a. c. type, with the necessary rectifier, step-down transformer and input transformer.

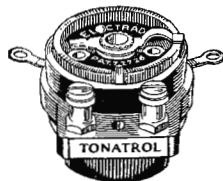
Instructions for assembling the 110 volt a. c. dynamic are shown hereafter:

The builder will find the field coil in the shell. If coil is removed for inspection be sure that leads are replaced the same as before removing coil.

The pole plate has two staggered dowel pins which makes it impossible to put the plate on wrong. Place plate on shell. Dowel pins engaging their proper holes so that air gap between plate and pole plug is uniform. There are holes in the aluminum frame which also engage with the dowel pins in the plate. Plate comes to you with the aluminum frame attached by means of the dowel pins, also with the 3/4-inch 10-24 machine screws for fastening frame and plate to the shell. After attaching to the shell, be sure to tighten screws and nuts. (Caution: Be sure that leads running from compensating coil wound on pole plug are brought straight down to outlet holes in shell, so as not to interfere with horizontal motion of the armature or voice coil.)

Place this assembly in bracket on top of a. c. unit. Screws for this are in the sides of field shell. You will find the armature or voice coil already mounted on diaphragm with leads cemented to one arm of the diaphragm. Place armature coil over the pole

A Complete Line of Volume Controls



Exclusively Licensed by Technidyne Corporation Under U. S. Patent Nos. 1593658, 1034103, 1034104

TONATROL

Trade-mark

Perfect control of volume to adapt your reception to the occasion and individual taste, is necessary for the full enjoyment of your radio. As circuits vary widely, so must the recommended systems of controlling volume.

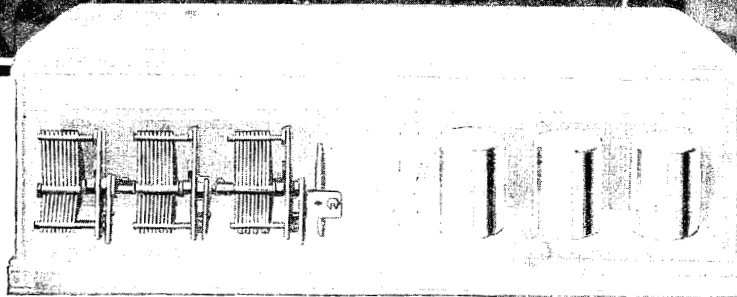
Tonatrol Volume Controls are designed in types to meet the specific needs of all circuits—A.C. or conventional battery type. Furnished in standard types or with filament switch or power switch attached, \$1.50 to \$3.00.

Electrad specializes in a full line of resistance controls for all radio purposes including Television. Dealers everywhere sell them.

ELECTRAD



In the studio of station W E A F, New York, from which some of the most delightful programs are broadcast.



Clearer reception, finer tuning, reduced interference with aluminum equipped receiving sets.

Reception as Fine as the Broadcast

EVERY DAY millions of families throughout the world are listening to delightful broadcast programs with a keener enjoyment because their radio sets are "Aluminum equipped."

Reception is made clearer, tuning made finer, interference reduced to the minimum by designers who have found that this wonderful metal meets the varied needs of radio so admirably.

Aluminum is the ideal radio metal because it combines high electrical conductivity, permanence, beauty and extreme lightness.

Leading radio manufacturers recognize its superiority. So, in many receiving sets you find

aluminum shielding, aluminum condenser blades and frames, aluminum foil fixed condensers, chasses, sub-panels and cabinets.

When you see an aluminum equipped set you will know that its manufacturer has done everything he can to bring the true enjoyment of radio to you—to give you reception as fine as the broadcast.

Look for aluminum in the set you buy—if you build a set, by all means, use aluminum. We will be glad to send on request a copy of the booklet, "Aluminum For Radio," which explains in detail the many and varied radio uses to which this modern metal is adapted.

ALUMINUM COMPANY OF AMERICA

ALUMINUM IN EVERY COMMERCIAL FORM

2465 Oliver Building
Pittsburgh, Pa.



Offices in 19 Principal
American Cities

ALUMINUM

The mark of Quality in Radio

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

America's Leading Kit House

Official Service Station for the Leading Kit Manufacturers

The confidence of the leading kit manufacturers is evidenced by our being appointed "Official Service Station." You will obtain here the same conscientious and courteous service the manufacturer would give you himself. Our corps of trained and experienced radio men will serve you efficiently.

All Parts Are Carefully Matched and Tested, Before Shipping, for the Following Popular Circuits

SM

S-M Public Address System
S-M 731 S.W. Broadcast, Television and Time Signal Receiver
S-M Round the World Receiver

HAMMARLUND-ROBERTS HiQ 29

Victoreen 1929 A.C. Super
Halldorson A.C. 56 Receiver
D.C. Master Receiver
Aero Seven Screen Receiver
Lincoln Super
Robertson-Davis Receiver
Citizens Super with HFL I.F. Amplifier
Tyrman 80 Receiver
Thordarson 210 Compact
Citizens Laboratory Amplifier
Citizens R.F. Receiver (Special)
How to Make a Grid Dip Meter
Citizens Special T.G.T.P. Screen S.W. Receiver

Set Builders and Dealers

Write or call on us for prices on any circuit appearing in any of the radio magazines. Our prices are lowest to professional set builders and dealers.

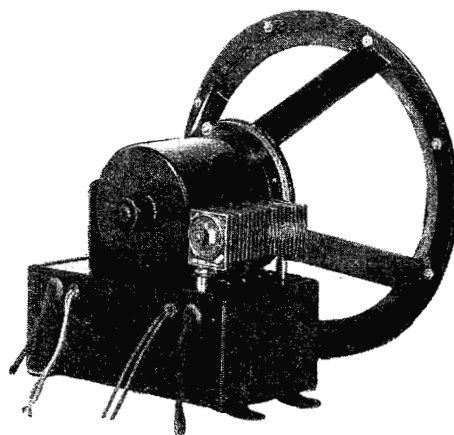
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We have a complete line of amateur transmitting and receiving equipment for short wave work. Write us for any amateur equipment.

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PHILADELPHIA, PA.

plug so that the holes in the ends of the diaphragm arms center with the 3 tapped holes in the aluminum frame. You will find the screws together with fiber washers already inserted in the aluminum frame. Remove these screws before putting the armature coil in position. When the armature coil is properly mounted you will find that the winding on coil is in a direct line between pole plate and pole plug. Mount the armature coil so that leads cemented to one arm of the diaphragm come out at the bottom or directly over the connection strip which is attached to the aluminum frame. You will find 4 narrow strips of paper in the



box containing armature coil. After you have mounted the armature coil and before tightening screws which secure the diaphragm, slip the 4 pieces of paper, one each at top and bottom and on each side between the inside of the armature coil and the pole plug. This will insure uniform clearance between pole plug and armature coil. Leaving these 4 pieces of paper still in position, tighten screws which fasten diaphragm to the aluminum frame. The next operation is to solder leads to the connection strip, pare and clean the 4 leads coming from the a. c. unit. To clean the end of armature coil leads use a fine piece of emery cloth or if you use a knife, be careful not to cut the leads. In soldering the armature coil leads to the soldering lugs, be careful that the leads do not contact with the edges of the diaphragm arm, and in this way rub or scratch the enamel from the armature leads. The black leads coming from the a. c. unit are connected in series to the leads coming from field coil. The green leads coming from the a. c. unit are connected in series with the compensating coil wound on pole plug and the armature coil. Be sure that all leads are carefully soldered in their proper positions. Your next operation is to cement the cone and skives. The cone is marked for cementing. Cement cone paper so that it forms a cone using care that the flap allowed for cementing comes right up to the line. When this has set your next operation is to cement the 4 leather skives on the edge of the cone. Care being used not to extend the leather below line marked around outer edge of cone. When this is done, cement cardboard ring to the skives. You are now ready to attach cone to the diaphragm. Be sure that your paper spacers between armature coil and plug are still in place. Before cementing cone to the diaphragm slip the small end of cone down over the fiber armature coil. If you have used care in forming your cone this will be a slip-fit. Before placing cone on diaphragm fill the 45 degree angle slot formed by the union of the diaphragm to the armature coil with cement. Then slip cone down over armature coil into this cement.

You will find that the cardboard ring fastened to the outer edge of your skives will accurately line up with the rim of the aluminum frame. If not, do this before cement sets. Also pierce the holes through skives and cardboard in line with holes in the aluminum frame. After slipping the cone down from the cement, place more cement around the edge of the cone and the armature coil. Allow to set for at least 15 minutes and longer if possible.

Symphonic

A high grade alloy core transformer having an approximately flat characteristic from 50 to 5000 cycles. For use in the first and second stage of any audio amplifier. Price \$10.00.

Symphonic Push-Pull Combination

comprises a Symphonic Type Y push-pull input or push-pull interstage transformer together with a Symphonic Type Z push-pull output impedance. Price per pair, \$10.50. Type Y only, \$14.00.

**Standard Equipment
Everywhere with
Radio Engineers**

The U. S. Government, technical laboratories, universities, broadcast stations and other places where radio values are known and only the best apparatus tolerated use

Samson Radio Products

from the tropics to the polar regions and in both the most humid and arid regions of the world. In the air, on land and under water you will find them in service.

You, too, can obtain these *same standard* stock units for your receivers from any jobber or dealer, or direct from us.

Standard

Symphonic Type O-7

is an output transformer designed for use with push-pull 210 tubes. Its impedance ratio is such that the most favorable conditions for quality and energy transfer are realized with a dynamic speaker having no built-in step-down transformer, where the secondary of the O-7 is connected directly to the moving coil. Price \$10.00.

Symphonic Type O-3

is an output transformer designed for use with push-pull 210 tubes. Its impedance ratio is such that the most favorable conditions for quality and energy transfer are realized with a good loud-speaker. The transformer operates with all ordinary loud-speakers and with dynamic speakers having a built-in step-down transformer. Price \$10.00.

Samson Symphonic Transformers are used in Samson PAM Amplifiers which operate from 105-120 volt 60 cycle house lighting circuits. Send for beautiful folder CRCB 2.

Samson Electric Co.

MANUFACTURERS SINCE 1882

General Office:
Canton, Mass.



Factories at
Canton and
Watertown,
Mass.

Symphonic Type O-4

same as O-3 but is designed for use with two 171's or two 250's.

Symphonic Type O-8

is the same as the O-7 but is for use with two 171's or two 250's. Price \$10.00.

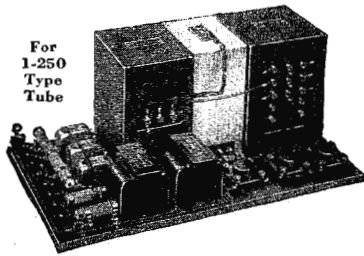


New T. C. A.

AMPLI-PACK

Makes Your Set an Ultra-Modern A. C. Power Receiver

A complete A. C. Power Supply—"A" and "B" and "C"—makes any D. C. set into an Ultra-Modern A. C. Receiver. Uses two 210 type tubes in push-pull; or one of the new 250 type tubes. Power Amplification gives perfect reproduction over the entire musical scale range.



Lets You Enjoy Real Musical Reception

Clear, bell-like tone. Powerful volume. AmpliPack gives you an advanced Radio instrument at less cost than ever before offered. Consumes no more current than an ordinary 50-watt light. Cool, quiet, dependable.

Quickly Assembled

You can assemble an AmpliPack easily in one evening. A screw driver, a pair of pliers and a soldering iron are all the tools needed. We supply complete layout diagrams. Simple to install. Attached to set in three minutes.

171 Push-Pull and Straight 210 Power Packs

Complete power supply units for home constructed amplifiers. Compact, scientific design together with silent, absolutely dependable operation make these our most popular Power Packs for home construction.

At All Leading Dealers

Ask your Dealer for AmpliPack. He can give you full details and our simple assembly diagrams. Don't be satisfied with out-of-date reception—build an AmpliPack tonight!

The T. C. A. High Quality Line

Also Includes

Audio Transformers, Audio Output Chokes, Power Packs and Chokes, and Other Transformers

Every coil in our Transformers is vacuum impregnated with a special compound. This prevents moisture disintegration and short circuiting. Clean cut laminations make them hum proof and banish noise interference.

Transformer Corporation of America

1428-32 Orleans St., Chicago, Ill.

Send Coupon for Free Booklet

TRANSFORMER CORP. OF AMERICA
1428-32 Orleans St., Chicago, Ill.

Please send me booklet on your complete line of Radio products.
No obligation or cost.

Name.....

Address.....

City..... State.....



Before the cement sets put on metal clamping ring which fastens the outer edge of the cone to the aluminum ring. When the cement is perfectly set remove the paper spacers from between pole plug and armature coil. You will now find that your armature coil is properly spaced and moves freely in the air gap between pole plug and plate.

Your speaker should now be ready for operation. When you have finished assembling the speaker you will note that the diaphragm, while it moves freely, is not too free. The reasons for not having too much flexibility in the diaphragm is to obviate as much as possible the a. c. hum and also distortion which result from a too loose movement of the cone and diaphragm.

Full descriptive literature, together with clear, step by step data on assembly accompanies each kit.

The Missing "Link" in Radio

THE X-L Radio Laboratories announce a new unit that at last makes possible the complete operation of a radio set from the light socket, including antenna and ground.

The unit that makes this possible is called the X-L Link, and provides antenna and ground, voltage regulator, double receptacle outlet, switch to control sets using A and B power units, and a fuse that protects the set. This is all encased in a small, compact, attractive unit that can be instantly connected to any set operating from the light socket.

Antenna and ground are obtained by specially balanced capacities coupled to the light wires, and in most cases this imparts an unusual degree of selectivity to an otherwise broad tuning re-



ceiver, as well as reducing interference from surrounding electrical disturbances.

On a multi-tube set the X-L Link is often preferable to an outside antenna and ground, which is very difficult and sometimes impossible to obtain in the small home or apartment.

The voltage regulator is manually controlled with a single knob and definitely protects the tubes of the set from overload caused by variation in line voltage. This is a very important feature in the operation of any radio set from the light socket, and is absolutely indispensable with sets using a. c. tubes.

Two outlet receptacles are provided so that both a B eliminator and A power unit, or a. c. converter can be attached. The line voltage regulator will operate just as effectively on these units as on the a. c. set.

A switch is inserted in the extension cord so that the set can be controlled therefrom if no other control has been provided.

The unit is equipped with a fuse as advised by the Fire Underwriters, which protects the set from accidental injury caused by the breaking down of any one device.

The X-L Link can be installed anywhere convenient to the receiver or inside of the cabinet if desired. With its use a single wire to the light socket operates the entire radio set. Made by X-L Radio Laboratories, 1224 Belmont Ave., Chicago, Ill.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

4 NEW HI-Q RECEIVERS

Custom-built To Any Pocketbook!

Again Hammarlund-Roberts opens the radio season with advancements in construction and performance that will be marveled at throughout the entire radio world.

This year, instead of merely one outstanding Custom-built receiver as in past years, we announce FOUR wonderful instruments—the result of the combined engineering efforts of the foremost parts manufacturers in America. FOUR brand-new models—a Junior D.C., a Junior A.C., a Master D.C. and a Master A.C. that establish a totally new standard in radio design.

The new Master Hi-Q typifies the marvelous efficiency of the entire line of 1929 Hi-Q's. A five-tube stage-shielded receiver that is built upon a solid steel chassis. Only the very finest parts in the industry are used, including the newscreen-grid tube. Circuit is a new development with a BAND-PASS FILTER, which effects absolute FLAT-TOP square cut-off TUNING for the first time to our knowledge in radio history. FLAT-TOP TUNING with 10 K.C. selectivity! "Cross-talk" is impossible with this set, for the reason that it is impossible to receive more than one station at a time, even in large cities where many powerful stations are broadcasting!

10 K.C. SELECTIVITY...ABSOLUTE FLAT TOP TUNING
COAST-TO-COAST RECEPTION...NEW TONE QUALITY
SCREEN-GRID TUBES . . . SHIELDED STEEL CHASSIS
CONCEALED WIRING...SIMPLIFIED CONSTRUCTION

This peak achievement of Hi-Q design is a real "coast-to-coast" instrument. Stations don't merely "swish" in as with

even the best of receivers. They absolutely "CLICK" in—sharp, clear, definite. No hum, no buzz, no oscillation—nothing but the pure, natural, clear-as-crystal signal exactly as it is delivered to the microphone.

There is nothing like this new Hi-Q Receiver available anywhere in any circuit at any price. Wonderful sensitivity. Wonderful selectivity. And tone quality that simply cannot be described.

The other three new Hi-Q 29 Receivers have similar qualities—each the fullest value available in the radio world—each a finer instrument than any ready-built receiver selling at \$50 to \$100 more money.

*Send Now for This New
80-Page
Construction Manual*

Biggest and most complete book ever published. Tells how to build the 4 new Hi-Q Receivers. Photos and diagrams illustrate every detail. Covers power amplifiers, tube and battery combinations, antennae, installation, short-wave adapters, house wiring and a wealth of other data on custom-built radio. Price 25c.



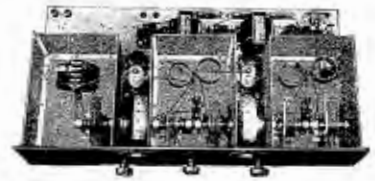
JUNIOR A. C. HI-Q 29

A screen-grid, shielded receiver made with the finest parts available. Extremely selective, sensitive, tone quality unsurpassed, simplified construction.

Junior Hi-Q 29 complete without cabinet, \$54.35. Junior A. C. Hi-Q 29 complete without cabinet, \$103.95.



Any Hi-Q Model, whether in this delightful console or one of the Hi-Q Cabinets, makes a pleasing, decorative adjunct to the finest interior.



MASTER HI-Q 29

The outstanding feature of this set is the Hi-Q Band-pass Filter, which actually effects FLAT-TOP TUNING within a 10 K. C. band. Also screen-grid tubes, completely shielded, concealed wiring. Master Hi-Q 29 complete without cabinet, \$99.50. Master A. C. Hi-Q 29 complete without cabinet, \$151.80.

HAMMARLUND-ROBERTS, INC., 1182-T Broadway, New York

Associate Manufacturers



Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest



Used by Leaders because They are the Leaders in their Field!

—with many types of resistances from which to choose, it is highly significant that the most important radio and electrical laboratories and manufacturers in this country have standardized on DURHAM Resistors, Powerohms and Grid Suppressors. The reasons are plain. *First*—there is a DURHAM Resistance unit for every practical need up to 100 megohms. *Second*—the DURHAM Metallized principle has proved its utter superiority for years. *Third*—DURHAM accuracy and uniformity can be relied upon regardless of the type of unit or the purpose for which it is used. Each succeeding year sees more manufacturers, laboratories, professional radio men and dealers and jobbers endorsing DURHAMS. Descriptive literature on the DURHAM line gladly sent upon request.

DURHAM

METALLIZED

RESISTORS and POWEROHMS

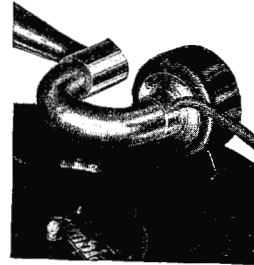
International Resistance Co., 2006 Chestnut St., Philadelphia, Pa.

Na-Ald Electric Pickup

SINCE the advent of the electro magnetic phonograph pickup, public interest in phonograph records of the newer, electrical cut type has been so high that there is a great demand for electric pickup units suitable for attachment to any phonograph.

The recent electric pickup announced by the Alden Mfg. Co. is an example of a simple, economical and efficient method of getting life-like reproduction of classical or popular records through a radio amplifier.

The illustration accompanying this brief description shows that the pickup is of the type that mounts directly on the tone-



arm of your phonograph. It does not matter how old the phonograph is, or whether it is large or small, or even a portable. All that is required is that the electric pickup be substituted for the old style reproducer. Two wires which lead from the electric pickup are connected to your radio set or to a Truphonic amplifier and music ais available through the radio combination.

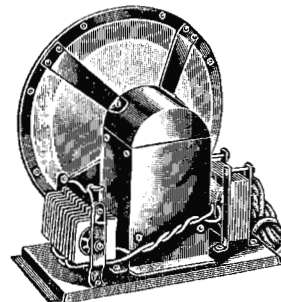
If the electric pickup is to be used in connection with an existing radio set, all that the listener must do is to remove the old reproducer from the tone-arm and slip on in its place the electric pickup. Two wires coming out from the electric pickup are used for connecting the output of the pickup to the electro tube circuit. One of these wires by means of a clip provides connection with the plate prong of the detector tube. The other wire from the pickup is connected to the plus 45 of the B battery or eliminator. Steel needles should be used in the pickup. The radio frequency tubes may be turned off while the set is being operated as a phonograph amplifier. If a volume control is desired, it may be inserted at the connector plug either in series or in parallel.

This device recently announced by the Alden Mfg. Co. of Brockton, Mass., is but one of a line of amplifiers, sockets, output units and midget speakers. The electric pickup is illustrated in Fig. 9 herewith.

New Thorola Dynamic Speakers

A NEW complete line of advanced dynamic speakers in table models, console tables and chassis (both a. c. and d. c.) is announced by the Thorola Radio Products Co., 110 East 21st Street, Chicago. One of the special features of this line is the extra large cone employed, which is 25 per cent larger than usual, providing considerably greater volume and increased efficiency.

For over te nyears Thorola has produced quality speakers of





Send for Free Booklet

The complete line of Weston Radio Instruments is fully described in Circular "J" which will be sent to any address upon request. It is a handy pocket manual which you will find useful in selecting the proper instruments for your testing requirements—containing many connection diagrams of practical application.

Portable Testing Instruments

(D. C. Model 489)

These designs are an outstanding achievement in high-grade small instrument manufacture.

They are enclosed in bakelite cases—black for D. C. instruments and mottled red and black for A. C. instruments. Their excellent characteristics and performance commend them



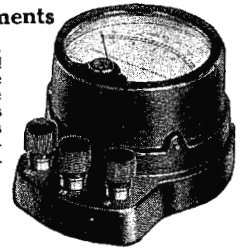
For A. C. and D. C. Operated Sets

(A. C. Model 828)

to the attention of all who appreciate excellent workmanship and demand unflinching reliability. The illustration above shows the 3-range model—750/250/10 volts for D. C. with 1,000 ohms per volt resistance. Also made as a 3-range A. C. instrument—150/8/4 volts. The D. C. 3-range instrument is priced at \$28.00. The A. C. 3-range instrument at \$16.50.

Single and Double-Range Instruments

This same design is also furnished as D.C. double-range Voltmeters—both high and low resistance models—and as single and double range Ammeters. Price \$13.50-\$22.50. For A.C. testing it is supplied as single-range Ammeters and Milliammeters and double-range Voltmeters. Price \$13.50-\$18.50.



AN INVESTMENT THAT PAYS DIVIDENDS

An indicating instrument is an essential part of every good radio receiver installation, since it aids in maintaining efficient operation, secures the best reception and fully protects the financial investment.

To advanced students of radio and those having professional connections with the industry the selection of instruments is highly important. Unfailing reliability is the first consideration since accuracy of measurement is a fundamental requisite of success in both research work and commercial servicing—and *pays the biggest dividends in actual profits.*

The proper choice of radio parts and accessories may be a matter of personal opinion, but the selection of instruments should be guided by universal preference and decided on scientific merit. Pioneering in the field of electrical measurement for more than forty years Weston leadership is acknowledged the world over.

Illustrated and described herewith are but a few of the complete line of Weston Radio Instruments. The models shown are particularly recommended for general radio service. On sale by leading dealers or write direct to the company.

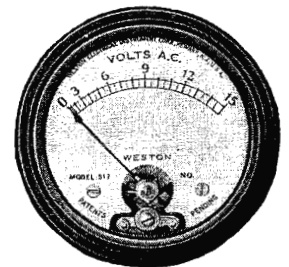
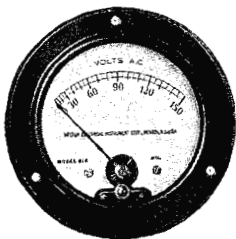
WESTON ELECTRICAL INSTRUMENT CORPORATION

574 Frelinghuysen Avenue

Newark, N. J.

Miniature Panel Instruments—2" and 3 1/4" diameter

A complete line of A.C., D.C. and Thermo-Couple instruments for flush panel mounting. They are matched in size and appearance and are made in a comprehensive list of ranges for every radio receiver and transmitting requirement, as well as for use in general testing work. These instruments have a guaranteed accuracy of 2% and may be left in circuit continuously. High internal resistance and excellent damping. Notwithstanding their superior workmanship and performance, they are most reasonably priced—\$7.00 to \$15.00.



A. C. Complete

and D. C. Set Tester

Model 537—a complete servicing outfit that will quickly diagnose the trouble in any type of radio receiver set made—without need for any additional equipment. The meters provided are equivalent to ten instruments:—a 3-range A. C. Voltmeter, 150/8/4 volts; a D. C. Volt-Milliammeter with five voltage ranges—600/300/120/60/8 volts (all 1000 ohms per volt); and two current ranges—150/30 milliamperes.

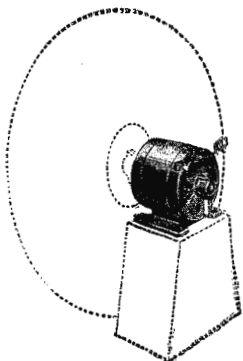


With this Weston Set Tester filament, grid, plate and cathode voltages are determined under actual operating conditions. It determines filament current requirements and plate current drain. It locates "shorts" between grid and plate as well as distortion in the audio system due to tube overloading. It provides for filament circuit and general continuity tests, and also serves as a rapid tube tester. Price, \$100.00.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

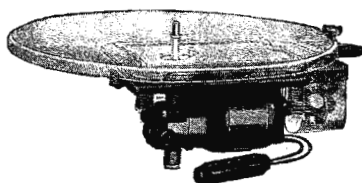
Three Bodine Units for Experimenters and Radio Fans

Bodine Type TV Motors For Television Scanning Discs



EXPERIMENTERS and Radio fans interested in television find Bodine TV Motors exactly suited for driving their scanning discs. These motors are designed especially for this work and provide unusual stability of speed,—yet with a suitable rheostat, the speed may be varied 25 per cent above or below synchronizing speed. Motors are furnished for 18-, 20- and 24-inch discs at all standard speeds from 900 to 1800 R.P.M. A special winding permits the motor to be run on either alternating or direct current.

Bodine Type RC-10 Electric Turntable For Phonographs or Radio-Phonograph Combinations



AN electrically driven turntable that absolutely cannot create sputtering noises in the loudspeaker. The motor is of the induction type, having no commutator or brushes to spark and cause interference. An easily adjusted governor maintains exact record speed regardless of line voltage fluctuations and also permits the speed to be varied according to individual taste. Spring supports absorb any vibration. Easily installed,—there are no belt or other connections to be made. For 110 volt, 60 cycle operation only.

Bodine DeLuxe Loop

A Beautiful Loop That Will Increase the Selectivity of Your Set

THE Bodine DeLuxe Loop, because of its pronounced directional characteristics, will greatly increase the selectivity of any superheterodyne or T.R.F. receiver. With a slight change in wiring it can be used to the same advantage on other sets. Very effective in congested broadcasting districts. Also ideal for apartments. Its beautiful design and finish will harmonize with any furnishings.



-----Mail This Coupon Today!-----

BODINE ELECTRIC COMPANY
2256 W. Ohio St., Chicago, Ill.

Please send information on items marked below.

- Bodine Type TV Motors for Scanning Discs.
- Bodine Type RC-10 Electric Turntable.
- Bodine DeLuxe Loop.

Name.....

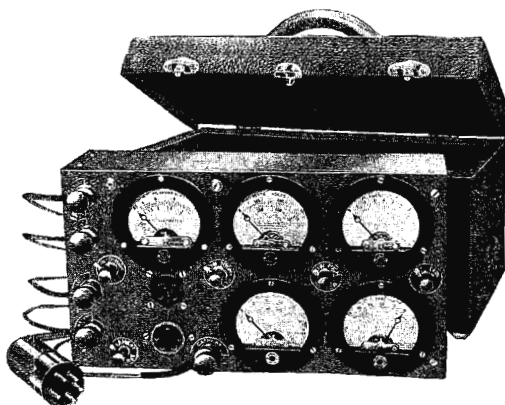
Address.....City.....

enviable reputation. Practically all radio fans remember the Thorotone horn speaker which operated in connection with a 6 volt A battery. In this speaker the application of the dynamic or power principle to the horn type speaker improved "horn reception" in much the same way as the new dynamic speakers of latest design improve the old style cone speakers. One of their units is shown in Figure 10.

The Thorola organization are also manufacturers of a full line of Thorola quality tubes in a. c., d. c., and power types. These tubes carry a written guarantee covering one year's trouble free operation, fully protecting the consumer as well as the dealer. A feature of the Thorola guarantee which has made the tubes popular with dealers and jobbers is that replacements are guaranteed direct at the factory, eliminating this detail entirely from the dealer or jobber. This has won wide acceptance for these tubes among the dealer and jobber trade which each year is demanding of manufacturers higher quality and a guarantee that is a real protection.

Hickok Radio Set Tester

AN interesting radio set tester manufactured by the Hickok Electrical Instrument Co., of Cleveland, Ohio, is shown in the illustration, Fig. 11, and is quite suitable for professional set builders, dealers and others requiring in service work a device to minimize the amount of time spent in diagnosing radio troubles. The model shown in the illustration accompanying this description is the A. C. 4600, suitable either for alternating or direct current sets and is a plate voltmeter with a double scale reading of 300 to 600 volts, with a resistance of 400,000 and 800,000 ohms. The second meter is an a. c. filament voltmeter with a scale of 3.3 and 10 volts, while the third meter is a d. c. filament voltmeter, with a scale of 7.5 volts and a resistance of 10,000 ohms. The grid voltmeter has a scale of 100-0-50 with a resistance of 200,000 ohms, while the plate milliammeter has a double scale reading of 20 and 200 milliamperes. Included in the unit is a set of cables for testing UX and UY type tubes, cable



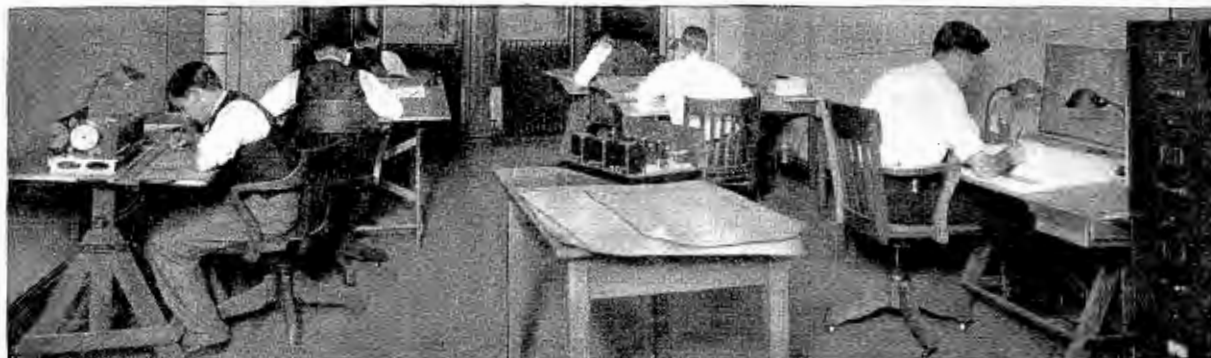
for heater connection to Kellogg tubes and an adapter for use in testing screen grid tubes.

This radio set tester is but one of a line of a. c. and d. c. measuring instruments.

New Antenna Announced

A NEW and quite novel ball umbrella antenna has recently been put on the market by the Essenbee Radio Devices Company of Chicago, who announce they have been accorded Canadian as well as United States patent letters thereon. The construction is of pure copper, nickel and silver plated. The manufacturer claims unusual selectivity and distance ability for this device. The attachment to the radio owner's roof is another novel feature, being made with a ball and swivel joint enabling erection on a roof of almost any angle.

OUR DRAFTING ROOM



This staff of highly trained draftsmen is continually preparing the most accurate and complete full size blueprints of radio receivers and power packs obtainable.

Blue prints are available on all circuits described in the CALL BOOK. Each set of prints is composed of all the necessary drawings prepared in such complete detail and accuracy as to enable an inexperienced builder to duplicate in every respect the receivers built in our laboratory, thus assuring positive success and the greatest satisfaction.

PLEASE ORDER BLUE PRINTS BY NUMBER AND NAME

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No. 56	Improved Browning-Drake.....	1.40	No. 126	St. James Twin Four.....	1.40
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No. 73	Magnaformer Super-heterodyne Receiver (5 drawings).....	1.50	No. 153	Citizens Shield Grid Short-Wave Receiver.....	1.50
No. 76	Tyrman Ten (5 drawings).....	1.50	No. 159	Hagerman 210 A. C. Six Receiver (6 drawings).....	1.60
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GRAPHIC WIRING DIAGRAMS

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No. 108	Aero A. C. Seven T.R.F. Receiver.....	.60	*No. 160	Thordarson 210 Power Compact.....	.60
No. 110	Lynch-Amsco 5-Tube Receiver.....	.60	No. 164	Thordarson 250 Amplifier.....	.60
No. 114	Lynch-Hammarlund 5-Tube Receiver.....	.60	No. 165	Citizens SG Booster Stage.....	.60
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No. 134	Nine-in-Line A. C. Operated.....	.60	No. 171	Thordarson Dealer's Amplifier.....	.60
No. 135	Electric Phonograph Power Pack.....	.60	No. 174	Sargent-Rayment Seven Receiver.....	.60
No. 136	Citizens Crystal Receiver.....	.60	*No. 178	Silver-Marshall 731 Short Wave Adapter.....	.60
No. 139	Silver-Marshall Shield Grid Super.....	.60	*No. 182	Haldorson A.C. 56—T. R. F.....	.60
No. 140	Citizens Radio Frequency Amplifier.....	.60	*No. 183	National Short Wave Receiver.....	.60
No. 144	AmerTran Power Pack.....	.60	*No. 185	Silver-Marshall "Coast to Coast" Four.....	.60
			*No. 186	Aero 7-29 No. 32 S. G. Receiver.....	.60
			*No. 187	Citizens Special Short Wave Receiver.....	.60

SCHEMATIC WIRING DIAGRAMS

*No. 160a	Thordarson 210 Power Compact.....	.50	No. 174a	Sargent-Rayment Seven Receiver.....	.50
No. 164a	Thordarson 250 Power Supply and Amplifier.....	.50	*No. 178a	Silver-Marshall 731 Short Wave Adapter.....	.50
No. 165a	Citizens SG Booster Stage.....	.50	*No. 182a	Haldorson A.C. 56—T. R. F.....	.50
No. 166a	Silver-Marshall SG Six.....	.50	*No. 183a	National Short Wave Receiver.....	.50
No. 168a	HFL Isotone.....	.50	*No. 185a	Silver-Marshall "Coast to Coast" Four.....	.50
No. 169a	Haldorson SG 5-6.....	.50	*No. 186a	Aero 7-29 No. 32 S.G. Receiver.....	.50
No. 170a	Silver-Marshall SG Super Nine.....	.50	*No. 187a	Citizens Special Short Wave Receiver.....	.50
No. 171a	Thordarson Dealer's Amplifier.....	.50	*No. 191a	Scott World's Record S. G. Nine "Battery Operated".....	.50

*Circuits described in present issue.

Any of the above blue prints will be sent postpaid by return mail upon receipt of the proper amount or they can be obtained from any of the Radio jobbers advertising in this publication. C. O. D. orders not accepted.

CITIZENS RADIO SERVICE BUREAU

508 So. Dearborn Street

7th Floor

Chicago, Illinois

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest



Price Complete
\$15.00

Amazing Results in A.C. Voltage Regulation with the WEBSTER Auto-Potentialator

HERE at last is the successful solution of the puzzling problem of A.C. line voltage regulation.

The new Webster Auto-Potentialator provides complete, instant and automatic regulation of A.C. current. It delivers to the A.C. set or A and B Eliminator an absolutely even flow of A.C. current of the exact voltage necessary for the most successful operation of any make of receiver.

The Webster Auto-Potentialator, besides being entirely automatic, contains no tubes or liquids—needs no complicated adjusting—never wears out.

It affords absolute protection from the sudden line fluctuations that occur in every A.C. lighting circuit. It gives marvelously steady, uninterrupted reception of highest possible efficiency, because tubes are operating at their peak point under exactly correct voltage. It greatly lengthens the life of A.C. tubes—saving you considerable money in tube replacements.


When you attach a Webster Auto-Potentialator to any factory built or custom built receiver, you at once and forever do away with the bugaboo of line voltage fluctuations. No more trouble—no more grief—just wonderfully clear, steady, uniform reception.

Sturdily built. Small in size. Slips out of sight in a jiffy. Measures about 8¾x4½x5¼ in. Never in the way. Silent. Absolutely dependable.

Order From Your Dealer Today

Order a Webster Auto-Potentialator from your dealer today. If he is out of stock and you are in a hurry you can order direct from us by filling out and mailing coupon below. If coupon is used, send check or money order for \$15 for each Auto-Potentialator ordered. Test it on your set—any set. If it does not do all that we claim, if it fails to give entire freedom from voltage fluctuation troubles, your money will be promptly refunded. Mail coupon today—NOW.

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850 Blackhawk St., Chicago

Ship me..... Webster Auto-Potentialators, price \$15 each I enclose \$.....

Name.....

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City.....State.....

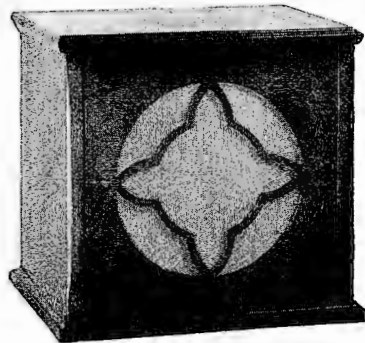


Wright-DeCoster Dynamics

BELOW are shown two types of dynamic models made by Wright-DeCoster, Inc., St. Paul, Minn., the first being shown in Fig. 12, which is the No. 108 chassis, for manufacturers' purposes as well as professional set builders.



Fig. 12



The second is known as the Cabinet B type and is for the trade, being marketed in an attractive cabinet.

Potter Interference Eliminators

AS the radio art grows older, more possibilities of interference develop, but fortunately manufacturers keep pace with this condition and are able to supply interference eliminators to take care of almost any type of interference of the man-made class.

Modern conveniences unfortunately gave no thought to radio reception upon entering the home of a set owner and as a result radio programs were spoiled by the interference from oil burners, ice machine motors, violet rays, vacuum cleaners, fans, etc.

The modern day appliances create an electrical disturbance



which finds its way into the radio set from the electric circuit and is of sufficient intensity to interfere with the reception of broadcast programs.

Fortunately, there is a remedy for these disturbances by the use of Potter interference eliminators to entirely offset and kill this interference before it can do any damage.

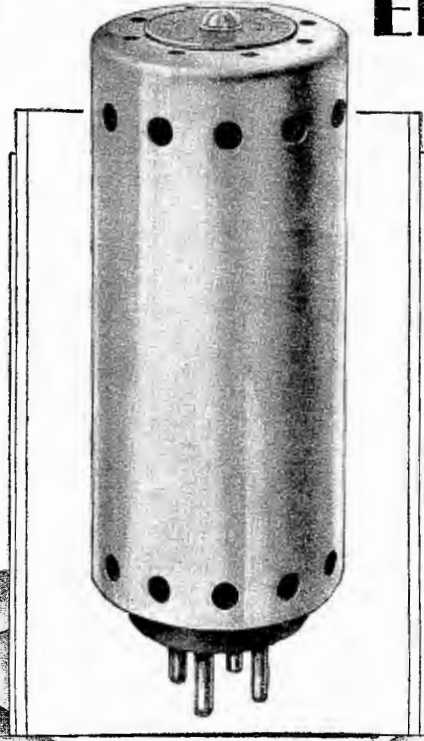
THE AMAZING NEW 5000 HOUR ELKON RECTIFIER FOR "B" ELIMINATORS

NEW, UNIQUE!

REVOLUTIONARY!

SOLID, DRY!

NOT A TUBE!



ONLY 200,000 AVAILABLE THIS SEASON

JUST as the Elkton dry, low-voltage rectifier revolutionized the design of chargers and "A" Eliminators, the new Elkton "B" type Rectifier will revolutionize the design of "B" Eliminators.

The Elkton EBH Rectifier plugs into any Eliminator using the former standard "B" rectifier tube. Simply take out the fragile 1,000 hour tube—plug in the husky Elkton EBH and the change is made. No changes in wiring—no adjustments.

It is sturdy, solid, dry—has none of the frailties of a tube—not affected by accidental overloads or line surges. It is self healing. The power is smoother, quieter.

From the orders already received from dealers and jobbers in all parts of the country, we know that we will be tremendously oversold this season—only 200,000 of these revolutionary rectifiers will be available.

The elaborate manufacturing, testing and aging equipment necessary to produce the Elkton EBH Rectifier precludes any greater production the first year.

Look for the Red and Yellow display carton on your dealer's shelves. The new EBH is packed in a metal can.

Buy one from your dealer today! Plug it into your "B" Eliminator—Trouble free for at least 5,000 hours!

ELKON, INC.

Division of
P. R. Mallory & Co., Inc.

PORT CHESTER, N. Y.



Hand and Eye must synchronize in testing the Elkton EBH Rectifier

Radio Department, Elkton, Inc.,
241 Fox Island Road, Port Chester, N. Y.
Gentlemen:
Please send me complete information on Elkton
Quality Radio Products.
Name.....
Address.....

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

*Specify
Belden*

High Quality Radio Products

**that are the choice of
experienced set builders**



Belden Aerial Kit
R. M. A. Standard

A complete aerial kit that contains every item essential to an efficient outdoor antenna system, such as aerial, ground and lead-in wires, lightning arrester, lead-in strip, ground clamp, glass insulators, nail-on knobs, etc. The Belden Aerial Wire cannot corrode in service. The Belden Jr. Aerial Kit, Belden Bare Copper Aerial Kit, and Belden Jr. Bare Copper Aerial Kit are also furnished for your particular needs.



Belden Indoor Aerial Kit

An ideal assortment for an indoor aerial, containing aerial wire, ground wire, ground clamp and instruction sheet. The neutral brown braid on the aerial wire is easily concealed on the moulding or around a window frame.



Belden Colorubber Hookup Wire

Ideal for set hookups and wiring. Flexible and easily fitted. Different colored rubber insulations make circuit wiring easier. Tinned stranded wire and cotton serve under Colorubber keep wire free from rubber and make stripping and soldering easy.



Belden Speaker Extension Floor Cord

An amazing new idea in loudspeaker extension cords. The extension wires are imbedded in a flat rubber strip permitting the cord to be run under the rug from the receiver to any part of the room. It lies flat on the floor, unnoticed, and without causing the rug to wear. Convenient terminals are provided on both ends. Ask your dealer to show you one today!

Get them from your dealer!

Belden Manufacturing Company
2322-A S. Western Ave.
Chicago, Ill.

Belden

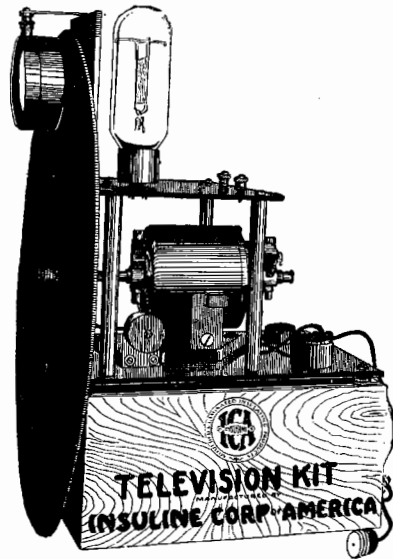
Simply connect a Potter interference eliminator shown in Figure 15 to line circuit at the point where the interfering device is connected and it will effectively drain the disturbance preventing its reaching the radio set.

The Potter interference eliminators are made for operation on 110 volt and 220 volt a.c. line circuits and three sizes of units are available for each type of line voltage which give a full line of Eliminators Made by Potter Mfg. Co., North Chicago, Ill.

Insuline Television Kit

TELEVISION experimenters will now find on the market a number of kits and parts for this fascinating study, one of the latest kits being manufactured by the Insulite Corporation of America, 78 Courtland St., New York City, N. Y., and illustrated in Fig. 16.

The complete television kit may be assembled in fifteen minutes and consists of a 48 aperture bakelite scanning disc, special motor, motor speed control, bushing chuck, magnifying lens, bakelite picture frame shield, bakelite sub-panel with socket for



television tube, light socket extension cord and plug, complete assembly, brackets, pillars, screws, etc.

As will be seen from the illustration, the kit is quite simple and compact and for those desiring a means of getting in a television quickly, this particular kit should be quite interesting.

In addition to television products, the Insulite Corporation also manufactures the Resistovolt, an automatic voltage controller for protecting alternating current lines leading to A.C. operated receivers.

Tobe "A" Eliminator

RECENTLY the Tobe Deutschmann Co. have entered the A-supply field with their Model 26-A illustrated in Fig. 17. This product fills the demand for a good A-supply, reasonably priced, carefully designed and assuring satisfactory service. It has a tapped secondary voltage control B eliminator

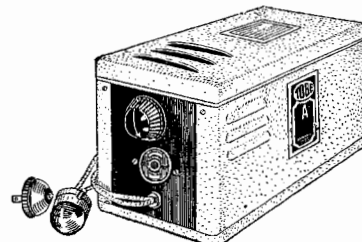


Fig. 17

TOBE



TOBE Tobe Type 250 B-Block



TOBE TOBE A-Filter



TOBE B BLOCKS—Model 760



TOBE

Radio Interference Filter No. 1



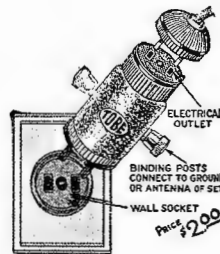
TOBE VACUUM TIGHT LEAKS



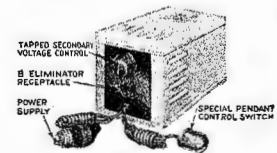
TOBE 5 WATT VERITAS FITS ALL STANDARD MOUNTS



TOBE TOBE 1300 Line Hi-Voltage SURGPROOF Condensers



TOBE 4-PURPOSE LIGHT SOCKET AERIAL



TOBE The New Tobe A Supply



TOBE TOBE A-Condenser

The test of the manufacturer's faith in his products is how long will he guarantee them.

Tobe apparatus is unconditionally guaranteed for one year.



TOBE 1000 Volt & 2000 Volt Transmitting Condenser



TOBE TINYTOBE Condensers



TOBE FILTER CONDENSERS



TOBE TOBE By-Pass Filter Condenser New Model

Tobe Deutschmann Co.

ENGINEERS, MANUFACTURERS AND IMPORTERS OF TECHNICAL APPARATUS
CANTON, MASS.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

CORWICO
Braidite
 HOOK-UP WIRE
 "THE BRAID SLIDES BACK"

Excellent for AC Work

*Can Be Easily Twisted
 for Filament Leads*

Braidite twists easily and holds its shape permanently after bending. Being a sleeve insulated hook-up wire it is safe to work with, yet is as convenient as bare wire. It is ideal for all A-C work. Braidite cuts wiring time in half. To make a connection, simply shove back the insulation. After soldering, the insulation slides right back into place, leaving no exposed sections of bare wire, and making a neat, clean-cut looking job. If you are not acquainted with Braidite, take advantage of our



FREE OFFER

Send us the name and address of your dealer and we will send you a sample package of Braidite FREE. Include 10c for postage.

Red, Green, Yellow, Blue and Black

List prices as follows:
 25 feet stranded Braidite.....35c
 25 feet solid Braidite.....30c

At All Dealers

If yours cannot supply you, order direct

CORWICO
RADIO'S BEST WIRES

ANTENNA WIRES

Stranded, Braided, Solid, Plain, Tinned, Enameled

COMPLETE ANTENNA KITS

From \$1.75 to \$4.50

HOOK-UP WIRES

"Braidite," "Flexibus," Colored Rubber

A-C ADAPTER HARNESSSES

Type R for RCA type tubes.....\$8.00
 Type A for ARCTURUS type tubes..... 5.00

CORNISH WIRE CO.

30 Church Street / / / New York City

receptacle, special pendant control switch and the cord and separable plug to go into the alternating current line socket. A generous two ampere output is given by this unit and the choice of four to six volts is available by use of a tapped secondary on the transformer. Since everything is dry within the "A" eliminator there is nothing to get out of order. This A-supply is designed for operation at 110-120 volts and 50-60 cycles and will take care up to an eight tube set, using the conventional quarter ampere tubes.

The unit is made by the Tobe Deutschmann Mfg. Co. at Canton, Mass.

Kabinettenna Replaces Aerial

IN the illustration accompanying this next text is a view of the recently announced Kabinettenna made by the Yahr-Lange, Inc., Milwaukee, Wisconsin, also known as the makers of the new ball aerial.

In addition to being one of the most efficient inside aerials, the Kabinettenna provides electric power for the dynamic speaker and radio set, thus giving complete light socket operation, with only one plug in the wall socket. This does away with unsightly wiring, double plug, cumbersome aerials. The unit may be mounted in or outside of the radio cabinet. With this device no



lighting arrester is required and reduction of static and local interference is accomplished.

The device consists of a separable plug and coil leading to a double plug and a binding post, the latter for the antenna of the receiver. The double plug takes care of either the A and B eliminator or power amplifier.

Sterling Vari-Tone Speaker

ILLUSTRATED in the photograph below is the model R-2 Vari-tone speaker, manufactured by the Sterling Mfg. Co. of Cleveland, Ohio.

The speaker is said to be the equal of many high priced dynamics and is beautifully made and of rugged construction. It



may be obtained in the form shown above or in a chassis for manufacturers' use.

In addition to the dynamic and Vari-tone speakers, the Sterling line includes speaker chassis, power units, amplifiers, voltage stabilizers, testers and meters.



Halldorson A. C. 56 Kit

Six Tube, Push-Pull—Using 226 and 227 Tubes

A. C. Receiver Perfected

The 226 and 227 type of A. C. tubes are no longer an experiment. They have been so perfected that they are now the standard tubes in the finest and most expensive radio sets made. The public wants A. C. sets that they can plug into a light socket and forget about.

Halldorson Set the Last Word in A. C. Kit Design

The Halldorson A. C. 56 receiver is the last word in kit design and embodies more new features than any other kit of its kind available to set builders. Its bronze front escutcheon plate carries all controls and may be mounted on the steel front panel supplied or the wood panel found in most console cabinets. All parts are mounted upon a steel crystalline finished sub-base and the sockets are riveted in place at the factory.

It has single control, illuminated dial, and graduated volume control. Stations boom in one after another as the big knob is turned. The audio system, the last stage of which consists of two 171 tubes in a push-pull circuit, develops tremendous power and gives a quality that is above criticism.

Handsome copper shields suppress entirely all outside interference and produce razor-edge selectivity. By a slight change this selectivity may be broadened for powerful distance reception, a feature particularly desired in the country.

Phonograph Pick-up Switch

An added feature is the phonograph pick-up switch, by means of which an electric pick-up may be attached to the receiver and phonograph or radio music had at will.

Simple Unit Supplies All Power

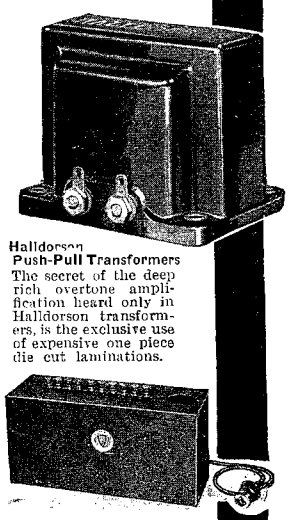
The simple power supply unit shown above is the secret of the wonderful performance of this new A. C. receiver. Operating from 110 volt, 60 cycle current, it supplies all A, B, and C voltages for the receiver. It filters out every vestige of hum or ripple from the power line, delivering current as smooth as that of batteries. All resistances for supplying grid bias and B voltages are contained entirely within the eliminator, thus removing the greatest difficulty met with in other A. C. kits.

Amazingly Low Price

Only the huge production facilities of the Halldorson plant make these prices possible. Compare the Halldorson A. C. 56 with any other kit on the market. Never before has such value been offered.

Halldorson A. C. 56 Kit, **\$63.85** complete.....
 Power Supply for same (factory wired)..... **37.50**

THE SHIELD GRID 56 is a receiver of similar design but for D.C. or eliminator operation. Uses shield grid tubes in the r.f. and first audio stages. Complete details on this and other Halldorson kits and parts sent upon request. Shield Grid A. C. model will not be available until shield grid A. C. tubes are out of the experimental stage.



Halldorson Push-Pull Transformers
 The secret of the deep rich overtone amplification heard only in Halldorson transformers, is the exclusive use of expensive one piece die cut laminations.

What the A. C. 56 will do!

Gives 5 to 8 K. C. separation on locals.

Brings in distant stations with tremendous power.

Develops a gain of 150 in the tuned antenna stage as compared with 8 in all other kits using resistance feed.

You will want to build one of these beautiful modern electric sets. See for yourself the amazing simplicity, power, distance and brilliant tone of this new Halldorson A. C. receiver.

The First Successful Complete A. C. Kit Ever Offered to Custom Set Builders

Halldorson Radio Products

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

THE HALLDORSON COMPANY 4745 N. Western Ave., Chicago

- I would like my name placed on your mailing list to receive all future literature.
- I am interested in Halldorson Products. Please send catalog.

NAME.....

ADDRESS.....

JOBBER'S NAME, IF ANY.....

Behind the **POLYMET** Trade Mark



The natives of an obscure Scottish isle specialize in weaving the finest of woollens. Shipments can be made only when a chance vessel calls. *Quality?* Yes, but delivery lacks dependability.

A one-time manufacturer of very fine automobiles is no longer in business. Again *Quality*, but owners lack service.

Behind the Polymet seal there is unquestioned *Quality*, and something more—the Polymet organization—insuring the utmost in *Service* and *Dependability*.

Send for the Polymet Catalogue.



POLYMET MANUFACTURING CORP.
609 Broadway, New York City

POLYMET PRODUCTS

With the Professional Set Builder

(Continued from page 92)

cratory or test equipment he has. His ability to service any or all "trouble shooting" inquiries submitted to him by the firm is also gone into, as well as whether he has any models of the firm's merchandise on hand for demonstration to prospects.

If the professional set builder passes this test with flying colors (there being four ratings as follows: A—excellent, B—good, C—fair and D—unsatisfactory), he is given official appointment as an authorized service station, furnished with window transfer signs and a metal service station sign, together with a complete line of literature covering the line. In addition to that he is given from time to time inquiries covering sales and service in his particular territory, which inquiries if diligently followed will mean financial rewards to him, either from a sales standpoint or from profitable servicing of existing sets.

As a further aid, the firm has in preparation a comprehensive manual for the professional set builder in the belief that the material included will be of help and profit to its readers, an inspiration to some and useful as a reference book to others. This manual tells the history of the concern down to the present time and in an interesting manner covers the subject of custom set building. It points out the many reasons why the custom built job is a better one. It also shows that professional set building is a lucrative source of income and gives many hints that can be profitably used by an ambitious set builder. This manual also describes the exact status of a service station and how the firm co-operates with these stations, even though not selling them direct. It also tells from what sources of supply the necessary kits and parts may be obtained locally or nationally, where to find prospective customers for custom radios and service and how to work up sales from the list of prospects sent out by the house. Special attention is paid to the subject of demonstrations in public places or special class customers. Informative data is also given on following up the prospect, how he is turned into a customer, creating interest and attention, catering to the prospects' likes and dislikes, letting the customer and the set sell for you, hints on meeting objections and a host of other helpful suggestions calculated to be of real help to a set builder in handling sales and service.

Handling "Trade-Ins"

There is also considerable data on business management policies and how to figure prices, profits and service. This information alone is very important to professional set builders. This is also true of the subject of "trade-ins" on which a definite policy must be followed. This manual gives an idea of how to handle "trade-in" sets profitably. Selling radios on time payments is the subject of another chapter, which is certainly very vital to the average professional set builder, as well as the related subject of how to handle collections.

After having looked over carefully the preliminary proofs of manual to be issued by Silver-Marshall, Inc., the representative of this department is quite sure that he has never seen a more clear, convincing and profitable treatise on the handling of custom set building. For obvious reasons much of the information which is considered quite vital cannot be reproduced here, since it is more or less of a trade secret and is available only to the duly authorized service stations operated by Silver-Marshall. If time, variety and amount of literature, accurate technical information and other activities of Silver-Marshall on behalf of their service stations is to be considered as a criterion, it is probably true that those individuals handling the S-M line are better equipped than any service representative of either a factory receiver or parts maker.

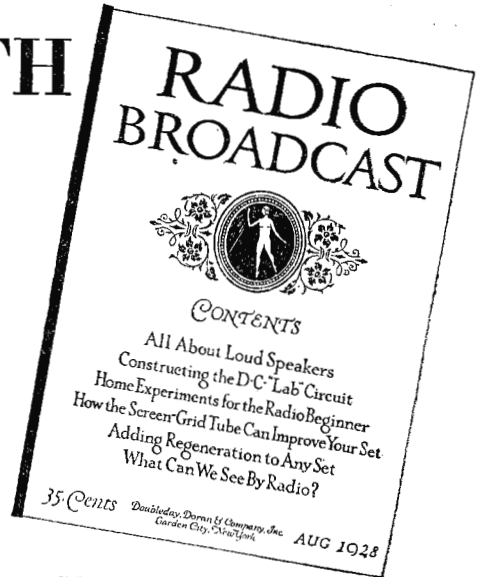
Bryden Dynamic Kit

Lack of space in this department prevents including the description of the Bryden dynamic kit here.

However, it will be found on page 120.



GET BOTH
AND
SAVE
\$1.95



This Offer is Good—Read It

The Citizens Radio Call Book and Radio Broadcast offer you a combined subscription rate whereby you can now get both of these magazines at a saving of \$1.95. Radio Broadcast and Citizens Radio Call Book are today the two best buys in radio magazines. The combination covers every field of radio. The Citizens Radio Call Book contains live radio information together with a complete list of all broadcasting stations, schedules and wave-lengths. The construction articles, circuit diagrams and detailed information on all popular circuits is of the utmost value to the home constructors, professional set builders and radio service men.

Radio Broadcast supplements the Call Book by giving you each month throughout the year a complete review of the whole radio situation. Radio Broadcast contains the news and interpretations of current radio events as well as exclusive special articles by the foremost radio engineers of today. The combination of Radio Broadcast and Citizens Radio Call Book can not be equalled from the standpoint of radio theory and practical data on every known phase of radio.

Send \$4.25 For Both and Save \$1.95

These radio magazines, if purchased at any newsstand, would cost you a total of \$6.20 a year. (\$4.20 for 12 issues of Radio Broadcast and \$2.00 for 4 issues of Citizens Radio Call Book.) By subscribing to both in combination you save \$1.95 over the newsstand price of both magazines. If you are a subscriber to Radio Broadcast or to Citizens Radio Call Book you can still take advantage of this low combination rate of \$4.25. We will extend your subscription for one year. Don't miss this opportunity!

Send \$4.25 Today **Mail Coupon Now**

**Citizens Radio Service Bureau, Inc.,
508 South Dearborn St., Chicago, Ill., U. S. A.**

Enclosed is \$4.25 for which please send the next twelve issues of Radio Broadcast and also one full year's subscription to Citizens Radio Call Book (4 issues).

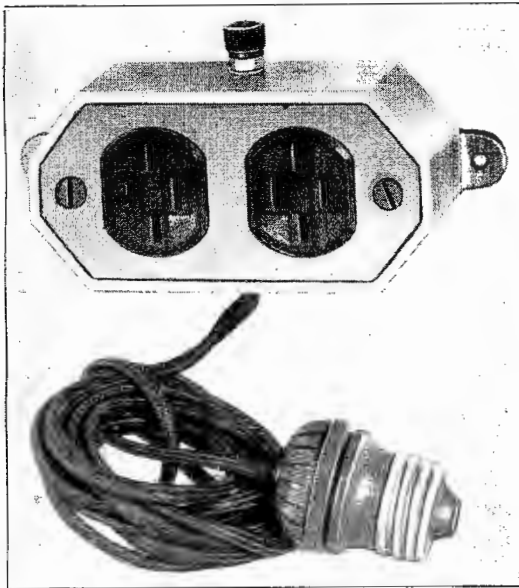
NAME.....

ADDRESS.....

I am a subscriber to.....Please extend my subscription one year.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

KABINETTENNA



Combines inside aerial with power lines---

You can eliminate unsightly wiring, double plugs, and cumbersome aerials,—eliminate all of these simply by installing the Kabinettenna. Kabinettenna requires no lightning arrester, reduces static and local interference; Kabinettenna is built on an entirely new and successful principle.

Prolonged tests have proved Kabinettenna the champion long distance performer of inside aerials, and users enthusiastically endorse the compact, efficient operation.

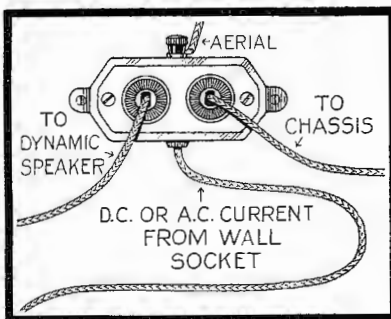
Money Back Guarantee

Backed by an iron-clad guarantee, Kabinettenna is positive assurance that you can get every voice from the skies. A trial will prove its superiority.

The diagram to the right shows how Kabinettenna is installed with the hook-up to the dynamic speaker, aerial and chassis.

Priced at \$4.50

A wonderful opportunity for profitable dealers' sales. Investigate now.



Kabinettenna is Radio's Greatest Forward Stride Since A. C. Reception

YAHR-LANGE

MILWAUKEE INCORPORATED WISCONSIN

Art and Commerce Combined



One enterprising advertising organization has combined art with commerce, as is shown in the above photograph. The sculpture is quite artistic and compelling. This method of advertising has been successfully used in the West for some time.

SERVICE work on radio sets involves a multitude of tests to determine which particular circuit is at fault. The remedy is usually the easiest part of the whole matter. Doubtless there are hundreds of professional set builders who have wished at some time or other that they had a complete test instrument by means of which they could determine almost automatically the cause of trouble in a radio receiver or power supply. While it is not very easy to diagnose mechanically a radio set's ailment, nevertheless the Supreme 400-A portable test set is about the closest approximation to a mechanical radio diagnostician that we have seen for some time. It is shown in the illustration Fig. 6.

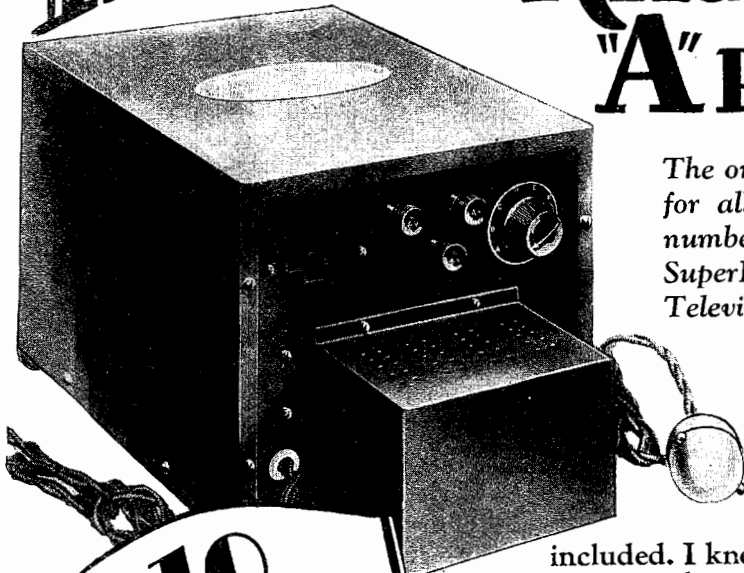
Briefly it is a complete radio laboratory involving precision instruments worthy of the finest radio engineer, in a handy carrying case. It takes all of the guess work out of radio building, assembling and servicing. With it a professional set builder can make any test on any radio set. Besides all of the indicating instruments, the 400-A model has all of the tools necessary for making needed adjustments and repairs quickly and easily.

Among some of the features of this portable laboratory is the fact that with this instrument it is possible to balance or synchronize condensers either with a meter reading or an audible click. This Supreme model is equipped with a self contained power



Fig. 6. This illustration gives the professional set builder an idea of the Supreme model 400-A complete portable radio laboratory

Now...4 or 6 Volts with the Improved Knapp "A" POWER



The only "A" Power suitable for all sets — irrespective of number of tubes — including SuperHets, Short Wave and Television receivers.

THE new Knapp "A" Power is designed for the most exacting service — super-hets, short wave and television receivers

included. I knew that if it would perform satisfactorily with these receivers that there could be no question as to its efficiency on ordinary broadcast signals. The three Elkon dry condensers, the improved choke coils and the special Elkon dry rectifier make the difference between ordinary and Knapp performance.

No Change in Price

Even with these wonderful and costly improvements, there has been no advance in price — due to the tremendous volume going thru my plant. Remember that the Knapp is the fastest selling "A" Power on the market.

KNAPP ELECTRIC, Inc.,
—Division of P. R. Mallory & Co., Inc.—
350 Madison Ave., New York City

10

Improvements

1. Two taps for 4 or 6 volt operation.
2. Larger filter system.
3. Three Elkon Dry Condensers instead of two.
4. Improved Choke Coils.
5. Pendant Switch Controlling "A" Power, "B" Eliminator and Set.
6. Dial for Regulating Voltage.
7. Celeron Front Panel.
8. Baked Finish.
9. Heavier Gauge Metal Cover.
10. Die Cast Base Plate instead of wood.

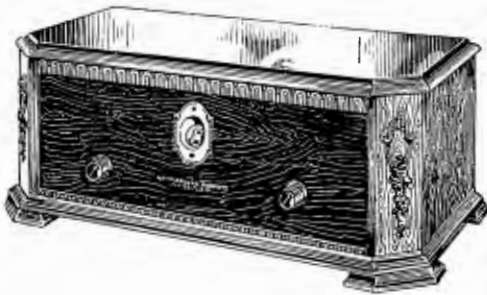
See your dealer today

Go to your dealer today. Most of the good ones carry the Knapp in stock. Do not accept a substitute — because only in the Knapp will you get full satisfaction as typified by the famous Knapp "A" Power. If your dealer cannot supply you send the coupon.



Mr. David W. Knapp, Pres.,
Knapp Electric, Inc., Dept. K-15
350 Madison Ave., N. Y. C.
Send me complete information on the Knapp
"A" Power.

HAMMARLUND-ROBERTS "Hi-Q 29" JUNIOR MODEL



2 Hammarlund No. ML-17 .00035 mfd. Midline Condensers	@ \$ 5.25	\$10.50
2 Hammarlund No. SGT-17 Shield-Grid R. F. Transformers	@ 2.50	5.00
1 Hammarlund No. RFC-85 Radio Frequency Choke	@ 2.00	2.00
1 Hammarlund No. SDW Knob-Control Drum Dial (Walnut)	@ 4.00	4.00
Hammarlund Mfg. Co., Inc.		
6 Benjamin Cle-Ra-Tone Sockets, No. 9040.....	@ .75	4.50
Benjamin Electric Mfg. Co.		
1 Sangamo .001 mfd. Fixed Mica Condenser.....	@ .50	.50
Sangamo Electric Co.		
1 Carter No. TP-3M Tapered Volume Control, 3000 ohms.....	@ 1.75	1.75
1 Carter No. 2 Battery Switch.....	@ .50	.50
Carter Radio Co.		
4 Parvult .5 mfd. Series 200 By-Pass Condensers....	@ 1.00	4.00
Acme Wire Co.		
2 Durham Metallized Resistors, ¼ megohm.....	@ .50	1.00
1 Durham Metallized Resistor, 1/10 megohm.....	@ .75	.75
2 Durham Powerohms, 1 Watt, 100,000 ohms.....	@ .85	1.70
1 Durham Powerohm, 1 Watt, 50,000 ohms.....	@ .85	.85
International Resistance Co.		
1 Yaxley No. 660 Cable Connector and Cable.....	@ 3.00	3.00
1 Pair Yaxley No. 422 Insulated Phone Tip Jacks..	@ .25	.25
Yaxley Mfg. Co.		
2 Eby Engraved Binding Posts.....	/ .15	.30
H. H. Eby Mfg. Co.		
1 "Hi-Q 29" Junior Foundation Unit (containing drilled and engraved Westinghouse Micarta Panel, two complete aluminum shields, drilled steel chassis, shafts, coupling condensers, resistor mounts, binding post strips, fixed resistance units, clips, wire, screws, nuts, washers, solder, and all special hardware required to complete receiver).....	@ 14.00	14.00
		\$54.60



Junior AC "Hi-Q 29".....	\$104.20
Master "Hi-Q 29".....	99.50
Master AC "Hi-Q 29".....	151.80

Dealers and Set Builders Write for Discounts

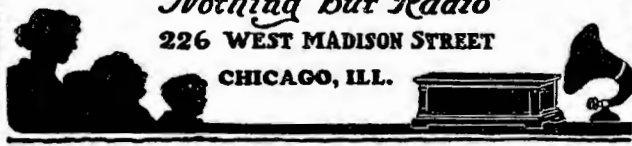
Telephone—DEARBORN 0083-0084

NEWARK ELECTRIC Co.

Nothing but Radio

226 WEST MADISON STREET

CHICAGO, ILL.



plant deriving its power from the alternating current line and giving perfect oscillation tests from every known type of tube from 1½ to 15 volts, including the screen grid, heater and rectifier tubes. Tubes ordinarily classed as normal with only the current pass tests are proven to be normal, abnormal or sub-normal with the Supreme oscillating tests and proper classification with consequent proper placing of tubes in the set is the result. In addition to that by means of this instrument it is possible to rejuvenate or reactivate any dethoriated filament tube. Any number up to a dozen may be rejuvenated at one time without their removal from the set.

The Supreme radiator in the 400-A model emits a modulated wave when plugged into the a. c. line. By this means a service man can ascertain the working condition of any set independent of broadcast stations. It will be found decidedly advantageous to tune to this modulated wave. Experience and familiarity with this wave will develop an accuracy unobtainable through tuning to a regular carrier wave with its occasional static, fading and other variable conditions. In the sturdy, brass bound leatherette carrying case of the model 400-A are the complete radio laboratory tools for radio service work, and compartments for tubes and other apparatus. A swinging tube shelf, instantly accessible, provides absolute protection for tubes. All necessary tools from screw-drivers to a soldering iron are supplied with the instrument and conveniently placed in a compartment in the lid of the case. Another roomy compartment provides space for radio accessories to be carried for replacement purposes.

This test set will open up any radio set almost like a book. Through the pin jacks one has access to all apparatus and can quickly make every necessary test. Open transformers may be bridged and radio sets played with transformers open. A service man can get condenser, choke coil outputs and capacity outputs on sets not wired for such connections. In addition this test set will permit break-down tests on condensers and contains fixed condenser from .001 mfd to 2 mfd, a 30 ohm rheostat and 500,000 ohm variable resistance and an audio transformer for instant use in various combinations. Voltage and current on all sets, including those using the 210 and 250 tubes, may be measured, the plate voltage circuits up to 600 volts and the grid circuits up to 100 volts. The output of trickle chargers or any output up to 2½ amperes may also be tested. All of the instruments in the Supreme model 400-A are fully protected by fuses and safety devices. The circuits are so arranged that an error in making a test will not damage the set. The model shown in this department is made by the Supreme Instruments Corporation at Greenwood, Miss.

Silver-Marshall Line Now Includes Public Address Systems

(Continued from page 65)

detector output circuit, a good magnetic phonograph record pick-up with record turntable and a double button carbon microphone with eight standard dry cells for its operation. Inasmuch as volume will be adjusted by the operator to suit the changing scenes in picture projection, it is assumed that the equipment will be located at a point where the operator may view the picture screened. Under these conditions, the PA-60A volume indicator panel is not required. The equipment above listed leaves a blank space for three PA-5A panels in the PA-1A amplifier rack, in which any desired equipment may be added at a later date.

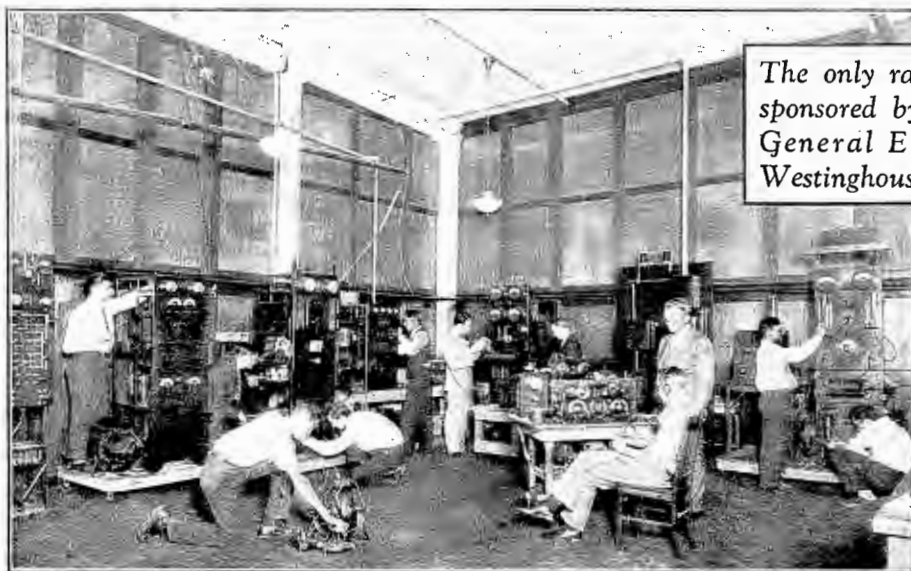
Other requirements for school, apartment house, race track or baseball park or for other services may be secured by requesting information on the public address systems made by S-M.

With such a wide diversity of amplifiers and controls, it should be possible for anyone interested in public address work to plan and bring into execution installations for public entertainment.

All engineering data covering this work may be secured upon application to the makers.

“It sure was a cinch learning Big-pay Radio at home . . .

through this ‘big-league’ laboratory method!”



The only radio training sponsored by RCA . . . General Electric . . . Westinghouse.

By Frank Halloran

I GOT hungry to get into Radio when I learned about the big money it was bringing my next door neighbor.

He was only twenty-eight years old, but his income was over four times as much as I was getting. He owned a fine car, dressed in expensive clothes, took weekends off to go hunting and fishing, and was one of the most popular fellows in town.

“Charlie,” I asked him one day, “how did you become a radio expert?”

“A cinch,” he smiled. “I took it up in my spare time at home.”

“What?” I asked in surprise, “you actually took a radio course by mail?”

“No,” he shot back. “Not just a mail order course, but the only technical home-laboratory training conducted under the auspices of RCA, Westinghouse and General Electric! Believe me, these ‘big-league’ organizations not only know what’s what in radio, but they know how to teach it!”

A Great Piece of Luck

Taking Frank’s advice was the luckiest thing I’ve ever done. It’s bringing me more money in a week than I’ve often earned in a month!

I never dreamed that learning radio at home was so easy and so fascinating. From the very first lesson to the last I was thrilled! Each subject was explained in simple word and picture form . . . and written in such an interesting style that I was carried along like a novel!

I didn’t know the first thing about radio when I started, yet before many months were over I was able to solve many of the problems which now help me command big money. The lessons took me step by step through trouble-finding and repairing . . . through ship and shore and broadcasting apparatus operation and construction . . . through photoradiograms, television and beam transmission . . . through radio salesmanship, store operation and executive work.

Success—In Spare Time!

I didn’t have to give up my regular job. I learned at home during my spare time. And I actually learned by doing! With the course, I received an outlay of the finest standard apparatus with which I was able to build radio circuits and sets of almost every description . . . yet this expensive apparatus cost me absolutely nothing extra!

Even before I had completed the course I was able to earn good money doing odd

radio jobs. And it wasn’t long after that I was able to give up my regular work and branch out for myself as a full-fledged expert in work that is fun and extremely profitable! My income has more than doubled . . . and I’ve only just started!”

Read This Thrilling FREE Book

Frank HaHoran’s wonderful success is just another typical example of the success which the Radio Institute is bringing to hundreds of men everywhere through its wonderful Home-laboratory training . . . the only official radio training based on the inside knowledge of radio developed in the great experimental laboratories of RCA, General Electric and Westinghouse!

There is an amazing opportunity for you in Radio. Manufacturers, dealers, broadcasting stations, ships . . . all are calling for trained radio experts. The pay is big—the opportunities are limitless—the work is thrilling! Find out all about it. The Institute has prepared an interesting, illustrated booklet telling you all you want to know about this vast industry and about the remarkable home-study course that can fit you for a brilliant radio career. Just mail the coupon below and claim your copy of this valuable booklet . . . it’s absolutely free!

Mail this coupon



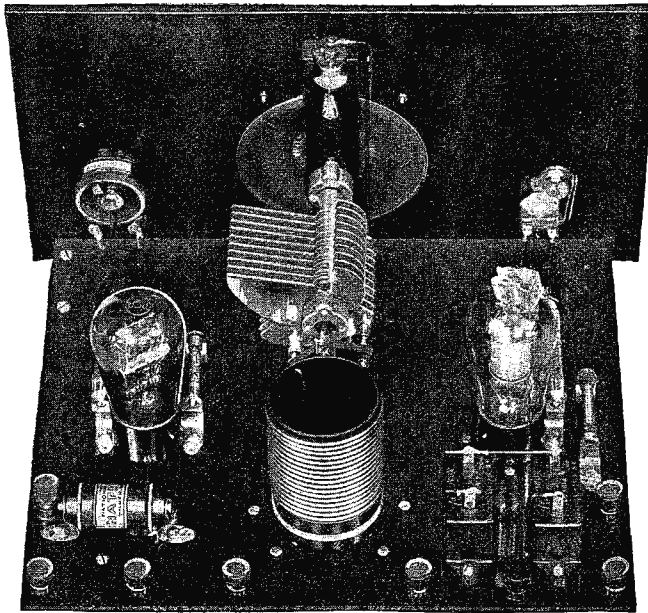
Radio Institute of America
Dept. B-11, 326 Broadway, New York, N. Y.

Gentlemen: Please send me your FREE 50-page book which tells all about the great opportunities in Radio and about your famous home-laboratory method of guaranteed radio instruction sponsored by RCA, General Electric and Westinghouse.

Name.....
Address.....

RADIO INSTITUTE OF AMERICA
326 Broadway, New York, N. Y.

Broadcast Reception All Around the World



Rear View of NATIONAL Screen Grid Short-Wave Set

Read this telegram from B. H. Taylor of Haverhill, Massachusetts, who uses a NATIONAL Screen Grid Short-Wave Receiver.

TELEGRAM

HAVERHILL, MASS., SEPT. 15, 1928
ENTIRE AFTERNOON AND EVENING SERVICES
OF EUCHARISTIC CONGRESS AT SYDNEY AUSTRALIA
RECEIVED HERE ON NATIONAL SHORT WAVE FROM
2ME EVERY WORD ON LOUDSPEAKER AND RELAYED
ON PHONE LINE PERIOD
B. H. TAYLOR

NATIONAL CO. INC. makes the essential equipment for this wonderful non-radiating short-wave receiver, described in Bulletin 128-CB.

Write for it today.



NATIONAL RADIO PRODUCTS

W. A. READY, PRESIDENT
MALDEN, MASSACHUSETTS

Citizens Super 8 Using H. F. L. Intermediate Amplifier

(Continued from page 71)

volts, while the plate circuit of the first detector, which is common with the screen grids of the three 222 tubes, secures whatever voltage is applied to it by means of the 25,000 ohm potentiometer previously mentioned as being across the B-67 and negative B terminals.

The schematic wiring diagram for this receiver is shown in Figure 5, while the graphic may be found by inspecting Figure 3. Considerable time may be saved in wiring the sets by means of the latter illustration. The layout of the parts is made in accordance with the baseboard drawing illustrated in Figure 4. Looking at the front of the receiver, as shown by the photograph in Figure 2, it will be seen that the left-hand dial governs the antenna stage tuning, while the right-hand dial is that of the oscillator. The knob in the center of the panel between the two vernier dials is the 25,000 ohm potentiometer used as a sensitivity and volume control method. The filament switch is at the extreme right.

Official Parts List

Parts used in the construction of the receiver are shown below:

- 2 639 Remler .0005 mfd variable condensers
- 1 Sangamo .001 mfd fixed condenser
- 1 Sangamo .0005 mfd fixed condenser
- 1 200 Acme Parvolt 1 mfd bypass condenser
- 1 HFL S-3 oscillator coupler
- 1 HFL A-3 antenna coupler
- 1 HFL Isotonic screen grid amplifier unit
- 2 AX Sangamo 3-1 audio transformers
- 1 Type E Sangamo 30 henry output impedance
- 3 804 Yaxley 4 ohm fixed resistances
- 1 1899 Frost 25,000 ohm variable resistance
- 1 Formica 7x26x $\frac{1}{8}$ inch black front panel
- 1 Formica 11x25x $\frac{1}{8}$ inch ivory sub-panel
- 1 Frost cable and plug 780-782
- 6 Eby engraved binding posts
- 2 9044 Benjamin sockets
- 2 9040 Benjamin brackets
- 2 VEC National vernier dials
- 1 10 Yaxley line switch
- 2 422 Yaxley pin jacks
- 2 720 Remler stage shields
- 3 Karas sub-panel brackets
- 3 Ceco or Sonatron 222 tubes
- 3 Ceco or Sonatron 201-A tubes
- 1 Ceco or Sonatron 112-A tubes
- 1 Ceco or Sonatron 250 tubes
- 1 Pkg. Kester radio solder
- 1 Pkg. Corwico Braidite hook-up wire.

Tyrman Imperial 80 Is Designed for the Custom Built Trade

(Continued from page 54)

graph radio switch and enables the amplifier to be thrown either onto the receiver, itself, or onto a phonograph pick-up.

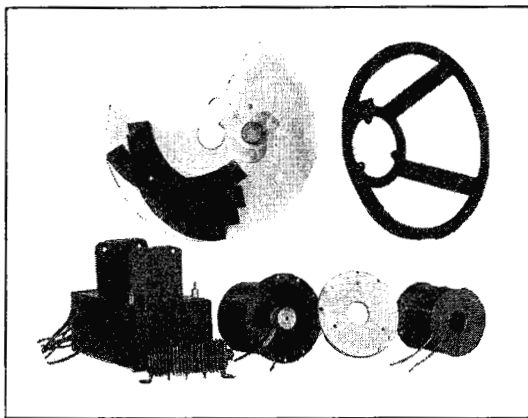
Few Adjustments

In operation of the receiver there are practically no adjustments to make, the signal desired being tuned in first on the right-hand drum, which tunes the oscillator coil, and then brought to resonance by rotating the left-hand drum which tunes the antenna input circuit. A small trimmer capacity is located on the oscillator condenser so that it may be trimmed in order to track with the antenna stage. In Fig. 2, at the left end, between the antenna ground posts and the i. f. transformer, are two .00004 mfd balancing condensers.

All parts required for the receiver are merchandised by the Tyrman interests in a complete carton.

Make Your Radio Deliver!

It will with the Bryden Dynamic Speaker



YOU CAN BUILD IT YOURSELF

YOU want a dynamic speaker, everyone does, but the price of an already assembled dynamic is high. With the **Bryden Dynamic Speaker Kit** you can build your own speaker and it will match your set perfectly.

Remember, the secret of perfect dynamic reproduction is the perfect harmony between your radio and your speaker. Bryden recognizes this fact, consequently there is no other on the market more successful than the **Bryden**.

Radio Call Book Magazine gives some mighty interesting and important data for set and speaker builders to consider. After you have read it again consider the Bryden speaker kit.

Dealers call it the outstanding speaker of the year in volume and tone—and it is easily assembled. Every part will fit perfectly. You can have it in operation an hour after it has been delivered. Prices are low, too; 110 volt AC, \$21.00; 110 volt DC, \$18.00; 6 volt DC, \$15.00.

If Your Dealer Cannot Supply You, Write Direct

We also supply models for 6 volt storage battery; 115 volt DC and 110 volt AC 25, 30, 40 and 50 cycle.

IMPORTANT

If you are to have efficient operation remember we must know the type of power tube used in your set.

Dealers and jobbers write for our proposition

BRYDEN PRODUCTS, Inc.
2559 Bellevue Ave., Detroit, Mich.

Enclosed is check or money order for the speaker kit I have checked:

- 110 volt AC.....\$21.00
- 110 volt DC..... 18.00
- 6 volt DC..... 15.00

Name.....

Address.....

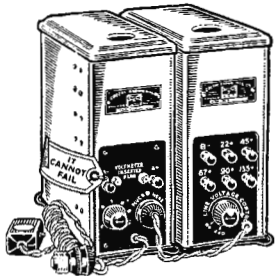
City.....

BRYDEN PRODUCTS INC.

2559 Bellevue Avenue

Detroit, Michigan

Now—you can make your present radio a SUPER AC SET without changing set or tubes



The Great
Greene Dry
Electric
"A"

\$37.50

The Great
Greene
"B"—5-6-7

\$27.50

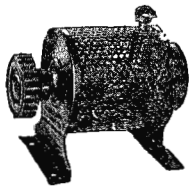
Perfected at last A & B power units that convert your present battery-operated radio into an AC set without changing set or tubes.

The great Greene A & B power units have received high praise from the radio industry. That's because they provide a steady stream of unflinching, noiseless power that improves the reception and tone quality of any set. Both work from same switch—variable control of voltage.

ELECTRICAL RESEARCH LABORATORIES
2500 Cottage Grove Ave., Chicago

Practical Television!

With the New



SPEED CONTROL CLAROSTAT

Given a good signal and neon lamp, satisfactory television comes down to the correct scanning disc driven at proper speed and in perfect step.

The speed control CLAROSTAT has been designed to serve both functions. Provides stepless speed control for universal or condenser type motor up to 1/4th horsepower. Push-button serves for momentary acceleration, in getting into perfect step. Sturdy, ventilated metal casing with mounting feet, 80-watt rating. Convenient. Easily operated. Ideal for television—but also excellent for many other applications.....

\$5

NEON LAMP CONTROL

The Standard CLAROSTAT is indispensable for applying a critical voltage on the neon lamp for the desired contrast between light and shade. A satisfactory image, with sufficient detail, depends on proper direct-current voltage for normal glow, yet low enough to permit of ample contrast with increased brilliancy due to signal modulations.

Write for descriptive literature on Television Clarostat and other Clarostats. Better still, send 25 cents in stamps or coin for "The Gate-Way to Better Radio"—88 diagrams and over 20,000 words of practical data.



Clarostat Mfg. Co., 285 N. 6th St., Brooklyn, N. Y.

CLAROSTAT
Reg. U. S. Pat. Off.

Multiplicity of Uses Found for "Round the World" Adapter

(Continued from page 87)

- 1 Silver-Marshall 511 tube socket
- 1 Silver-Marshall 317 .00014 mfd variable condenser
- 1 Silver-Marshall 316-B .00035 mfd tickler condenser
- 1 Each Silver-Marshall 131-T, 131-U, 131-V and 131-W coils for short wave band
- 1 Silver-Marshall 512 5 prong socket
- 2 Silver-Marshall 277 r. f. chokes
- 1 Silver-Marshall 275 r. f. choke
- 1 Silver-Marshall 818 hook-up wire
- 1 Silver-Marshall 738 adapter plug
- 1 Na-ald 481 XS spring socket for detector
- 1 Yaxley 20 ohm midget rheostat
- 1 Yaxley 500 switch attachment
- 1 Polymet .00015 mfd condenser
- 1 Polymet .005 mfd condenser
- 1 Polymet grid leak mounting
- 1 Polymet 5 megohm grid leak
- 1 Sprague 1/4 mfd midget condenser
- 2 Carter RU-10, 10 ohm resistors
- 7 Binding posts consisting of 8/32 screw nut and insulated top
- 2 National type B vernier dials
- 1 Set hardware consisting of two 1x1/4 in. hollow studs, five 1 1/4 in. by 6/32 in. R. H. machine screws, 17—1/2x6/32 R. H. machine screws, 14—6/32 nuts, 18 shake proof lock washers, 18 soldering lugs, 1 screen grid clip, 1 pair instrument insulating washers, 4 rubber feet, 3 lengths bus bar, 3 lengths spaghetti
- 1 Pkg. Kester radio solder
- 1 Ekko ground clamp

Shield Grid Model 32 Is Aristocrat of Aero Line

(Continued from page 63)

nounced lack of selectivity and the receiver will most likely bring in nothing but local stations.

Wiring in Cable Form

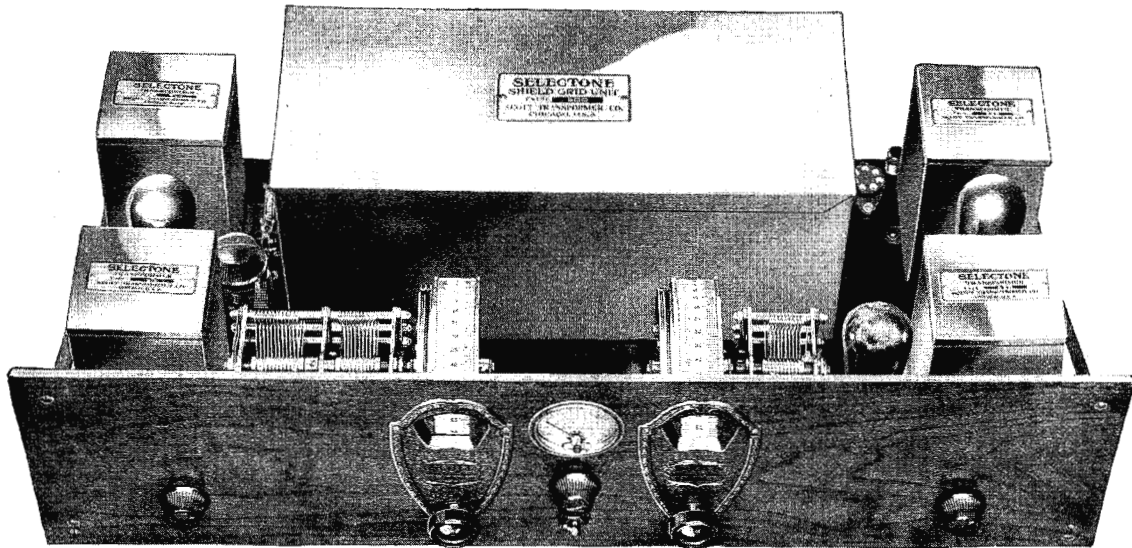
Referring to Fig. 1, the builder will note that at the edge of the subpanel may be seen the various wires properly arranged in cabinet form. After these wires have been run, they may be laced into a cabinet with twine or string.

Parts used in the construction of the model 32 Aero 7-29 receiver are shown in the accompanying list:—

Official Parts List

- 1 Aero No. 32 foundation kit
- 1 Aero Special four gang condenser, .00035 mfd
- 1 Aero Special Precise midget condenser
- 1 Aero U-233 coil kit
- 4 Aero C-60 Noskip choke coils
- 1 Aero antenna adapter
- 2 Aero Type AE-770 audio transformers
- 1 Aero bushing for dial shaft
- 1 Aero Special type AE-250 Centralab resistor
- 5 Aerovox moulded .001 mfd condensers
- 2 Aerovox 1 mfd bypass condensers
- 1 Yaxley 802 2 ohm resistance
- 2 Yaxley 422 tip jacks
- 1 No. 7 ballast
- 1 National type E illuminated dial
- 3 Kurz-Kasch walnut knobs
- 4 Shield grid connectors
- 1 Eby binding post
- 1 Allen-Bradley 3 megohm grid leak
- 1 Ekko ground clamp

SCOTT'S World's Record SHIELD GRID NINE



Radio's Greatest DX Performer Gives You Hair-Line Selectivity - Wonderful Tone - Tremendous Volume

For three years the Scott World's Record Receiver has challenged the world of radio to equal its amazing performance. Today the challenge is still unanswered!

If ever, the ultimate in radio has been attained—here it is!—in the NEW Scott Shield Grid Nine. The New Scott Nine is the logical development of the famous original Scott World's Record Receiver, which during a test of three months established FOUR WORLD'S RECORDS on distant reception, and brought in stations night after night 6,000 to 8,000 miles distant. This New Scott Receiver provides reception such as only the fine *custom-built* set can offer—reception such as you have only to hear once to realize that this wonderful receiver is fully years in advance of radio development today.

4 Hours to Build

Here's a set with no tricky adjustments. You can build it in 4 hours easily. Panel and sub-panel are drilled to receive each part. Simply wire it up—plug in—and you have your receiver operating at maximum efficiency. Shielded Grid Amplifier Unit comes fully tested and wired. Transformers are perfectly matched, with no exterior adjustments to make.

Tuned R. F. and Shield Grid Long Wave R. F. Give Amazing Results

The output of the Scott Shield Grid Nine is much greater than the average good "super" for two fundamental reasons. First, the completely shielded stage of high gain T. R. F. delivers an input to the Shield Grid Amplifier equivalent to the output of the best 4-tube T. R. F. receivers. This gives the Shield Grid Amplifier a much stronger signal to work with, than in the ordinary straight "super"—a tremendous advantage obtainable in no other "super." The second reason for the greater output, is the design, construction and complete scientific shielding of

the Scott Shield Grid Long Range Amplifier, affording this unit a far greater amplification factor than any existing screen grid long range amplifier.

Extreme Selectivity Always Obtainable

The tremendous output of the New Scott means extreme selectivity—not "fussy" uncertain selectivity, but razor-edge sensitivity obtained in a stable circuit condition with tubes operated at normal voltage.

Precision Matching of Parts

The New Scott uses shield grid tubes in an improved circuit with new power pack and amplifier. All parts of this amazing receiver are designed especially for this set, and are matched with absolute precision. The extreme care taken in testing and matching of parts is one of the reasons why the New Scott outperforms in all competitive tests of distances, selectivity, volume and tone. All stations come in at one point only

on the dial; a further improvement is evidenced in the fact that both dials track together.

Low Operating Cost

The New Scott Shield Grid Nine can be economically operated with dry batteries, and will give ample volume for the average home. The eight tubes incorporated in the receiver draw only 29 mils. Maximum volume is obtained by the use of the Scott Power Pack and Amplifier incorporating the ninth tube for the second stage of audio. This is the latest 250 power tube giving tremendous volume with perfect tone quality.

We Guarantee that you can build the New Scott Nine and get the same results we obtain from our Laboratory Models.

FREE Circuit Diagram and Particulars

Write at once for full particulars! Get the facts about this amazing new world's record receiver—its low cost—limitless range—tremendous power—10 kilocycle "razor-edge" selectivity. Build this set and enjoy radio at its best! Free Circuit diagrams. Also copies of 6,000 to 9,000 mile reception verification. Mail coupon today for the interesting information.

SET BUILDERS

SELL in a Protected Market

Set builders should read every word of Mr. Scott's statement which appears on page four and five. This is a serious situation. If you are to build up a permanent, prosperous radio business for yourself, you must have the kind of support that Scott gives you. You can't afford to spend time, effort and ability building up a demand in your community only to have it supplied through net-price catalogs.

Get Behind This Fine Receiver

It sells on demonstration. We help you to secure and bring in prospects through our elaborate sales plan, which includes mailing folders with your name imprinted, a special Sales Manual and other sales helps. Tie up with the Scott Plan. Make each day build for the future, toward the day when you will have a real, genuine established business.

—Mail This Today—

Scott Transformer Co.
4448 Ravenswood Ave., Chicago, Ill.

C. B. 11

Please send me FREE circuit diagram, records and full particulars of this new Scott Shield Grid Nine.

I am interested in your proposition to professional set builders.

Name

Street

Town

State

SCOTT TRANSFORMER CO.

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Parts for All Circuits

We have in stock, ready for immediate delivery, and at the market's lowest prices, all the parts specified in all the circuits described in this issue of the Citizen's Radio Call Book. We also carry a complete stock of parts for all the popular circuits described in the leading radio magazines and newspapers.

WRITE
Us Your
Wants
—
We Will
Send Our
Prices

YORKVILLE

RADIO COMPANY

143 East 86th St., New York City

The ABC of Radio

(Continued from page 97)

dition of body capacity. This condition does not exist very much in this day and generation, because of the prevalence of shielding. In the past, however, body capacity has been construed to mean that when the listener's hand was placed adjacent to a receiver circuit, especially the grid circuit, that the set either howled, whistled or increased or diminished in volume in accordance with the position of the listener's hand. In effect, this condition obtained because any body has a definite capacity for storing electrical energy. If the operator's hand is placed near a critical circuit, such as a grid circuit, the very presence of the body adjacent to this circuit is sufficient to disturb the normal circuit balance. This condition was more noticeable when a tube was slightly regenerative, since in that condition the tube is the most sensitive of all. This same condition could also have existed if a body of metal had been placed close to the receiver, but was most observed, of course, when the hand was placed near, simply because the operator would be more likely to explore around the set with his hand than he would with a piece of metal. In addition to that, there is also a capacity effect that occurs when the listener is wearing a pair of head phones and places his hand near the radio frequency portion of the circuit. In this case, this corresponds to a feedback, whereby the audio energy from the head phones is led back into the radio frequency end of the set and reamplified and disturbs the normal balance of the receiver. Nowadays, practically all receivers are either totally shielded or partly shielded and body capacity is practically extinct.

Phonograph Pickup

One of the puzzling things to a newcomer in radio is the term "radio pick-up". There is nothing very mysterious about a phonograph pick-up. Briefly a phonograph pick-up, which is the opposite of a loud speaker, is a device using a needle which runs in the groove of a phonograph record and translates the minute serrations or indentations in this groove into electrical energy, which passes through the grid circuit of an amplifying set and is amplified at audio frequencies for the benefit of the listener. In the case of the loud speaker, the speaker takes voltage and translates it into movement of the diaphragm, which is audible as sound waves. In the case of the phonograph pick-up, the opposite occurs, for here the needle takes mechanical motion and transfers it into electrical energy, which, when amplified, is audible in a speaker. Phonograph pick-ups of the electrical type are so superior to the old style tone arms on the old phonographs that there is no comparison between the two. In fact, the present prosperous condition of the phonograph industry may be largely attributed to the invention of the electro-magnetic unit and quality audio amplification available today.

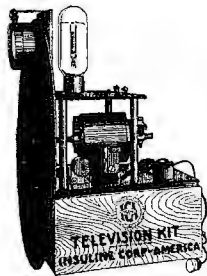
Circuits In Tube

Some readers have wondered as to the meaning of the words "plate circuit". Every receiving tube has three different circuits. The first is the filament circuit, which involves a heated wire inside of the glass tube, this heated wire emitting electrons which flow from the filament towards the plate; the second circuit in any vacuum tube is the grid circuit, which is interposed between the filament and the plate in such a manner that it acts as a valve or regulator; and the third circuit is the plate circuit, which is always positively charged by the B battery. Thus, when a tube is turned on the filament is lit and when warm begins emitting electrons, whose natural tendency is to go towards the plate, which is positively charged. These electrons are negatively charged once and it is natural they will seek their affinity in an oppositely charged particle. The grid circuit acts to either increase or decrease the electronic flow from the filament. When the grid is positive more electrons are attracted towards the plate and the current in the plate circuit rises or increases. When the grid is oppositely charged, or negatively charged, the current flowing in the plate circuit is reduced. This condition or phenomena accounts for the ability of the tube to act as a detector,

Announcing—THE NEW AIR-COOLED RESISTOVOLT AUTOMATIC VOLTAGE CONTROLLER

I. C. A. TELEVISION Complete Kits and Parts

The I. C. A. Television Products are acclaimed the finest experimental apparatus obtainable. We can supply all individual parts; complete Kits in 4 models.

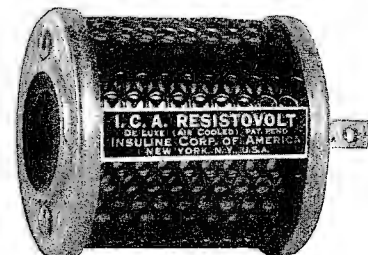


- Model 65 (complete with Television Tube and Television Amplifier)..... \$65.00
- Model 52 (same as 65 less tube)..... \$2.50
- Model B-1 (without amp. or tube)..... 37.50
- Model 45 (Same as B-1 but with improved motor) 45.00

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ANTENNAVOLT

The acme of engineering achievement: A combination of the New Air-Cooled Resistovolt and a perfect light socket aerial, minimizing static, improving tone quality, increasing selectivity, sharpening tuning, at the same time protecting tubes and sets from excess voltage, line surges and damage from lightning. The construction and efficiency of this product are the talk of radio engineers! List price..... **\$2.25**

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ALSO—Flechtheim Superior Voltmeters for A.C. and D.C.

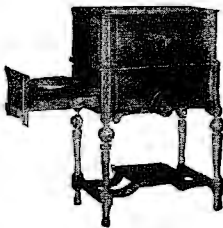
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A. M. FLECHTHEIM & CO., Inc.
136 Liberty St. Dept. CC New York, N. Y.

The "DREXEL" A-C Super Console Is Another Masterpiece by Fritts

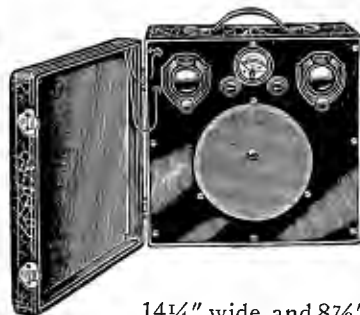
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With or without electrically operated phonograph turn-table.
Is "Super Built" throughout and with the very finest hand-rubbed finish. The overlays are genuine Walnut burl. The legs are beautifully shaped, turned and fluted.
The stretcher at the base has a speaker shelf 12" x 14" just large enough to accommodate any standard cone or dynamic cabinet type speaker.
The "Drexel" is made in two panel sizes, 24" and 30", with an apparatus compartment 13½" deep.
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The ALVON ~ ~ Custom-Built Radio



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You can enjoy the convenience of this unique and perfect loudspeaker **absolutely free**. This speaker is especially convenient because it can be used in different rooms of the house, at the table during meals—or in apartments late at night without disturbing others. Though small in size—the Midget Cone Speaker is a practical speaker with a surprising number of uses in your home. This speaker is manufactured by one of the largest radio manufacturers in the country.

While they last—only one speaker will be presented free to each customer who mails in the coupon below for a year's subscription to Citizens Radio Call Book Magazine.



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The supply is limited, so do not delay in sending in the coupon.

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Here's my \$1.75 (Foreign \$2.00), for which please send me Citizens Radio Call Book Magazine for one year, beginning

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This subscription entitles me to a free Midget Loudspeaker.

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since when the grid is negatively charged practically no energy passes the plate circuit where the headphones are located and the conversely when the grid is positively charged a large increase in plate current is observed. This means that with radio frequency changes of both negative and positive polarity on the grid the plate circuit would respond only at times when the grid is positively charged and would relax at such times as the grid is negatively charged. This means that the plate circuit is then functioning at an interrupted rate, and a much lower rate than the grid circuit. On many occasions the grid circuit is called the trigger since a small potential variation in the grid will cause a correspondingly larger potential variation in the plate circuit.

Proper Grid Leak Value

QUITE frequently readers will write in to the Technical Department to ask as to the difference in value of grid leak that should be used with a detector tube. There is no well defined rule that may be given as to which value among several is the best for operation. This is partly due to the fact that receiving tubes are used as detectors either in an oscillating condition or in a regenerative condition. When used in a regenerative circuit, it usually is found that the higher the grid leak used the greater the sensitivity of the tube. However, there are occasions when one runs into difficulty on this score by having the set so sensitive that it is unstable. For example, in working on short waves where an extremely sensitive set is desired, grid leak values may run from 1 to 6 megohms. With the 6 megohm leak the set will be extremely sensitive, but it may be unuly so and may be shocked into oscillatio by a static burst. On the other hand a 1 megohm grid leak may stiffen the circuit to such a point that considerable regeneration is required before the set slips into oscillation. Therefore, it is usually a good idea to have four or five different values of grid leaks on hand and try them until best results are secured. In the case of a non-regenerative receiver it is not quite so easy to see the difference between one grid leak and another, although there is some one value between 1 megohm and 6 megohms that it is the best. Here again it is almost necessary for the individual operator to experiment with different values of grid leaks until he secures a condition most satisfying to himself. After all the grid leak in the cricuit merely increases or decreases the bias on the grid of the tube and, undoubtedly, a value that would be satisfactory for one operator would not be for the next.

Braves Atlantic in Outrigger

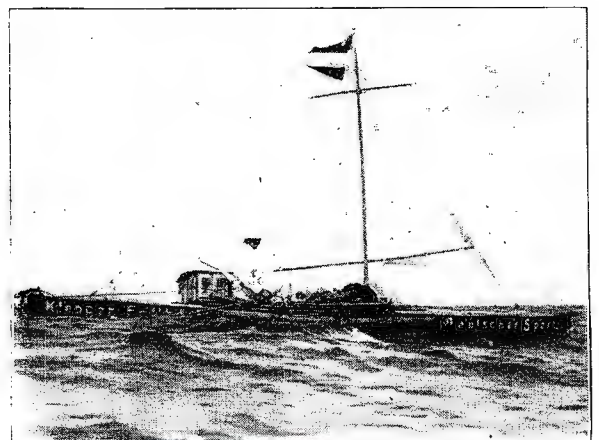


Photo Wide World

Capt. Franz Romer, a German, who alone negotiated the 2730 miles of open ocean from the Canary Islands to St. Thomas in the Virgin Islands in 58 days, as he was last seen on his way northward to Florida and New York.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

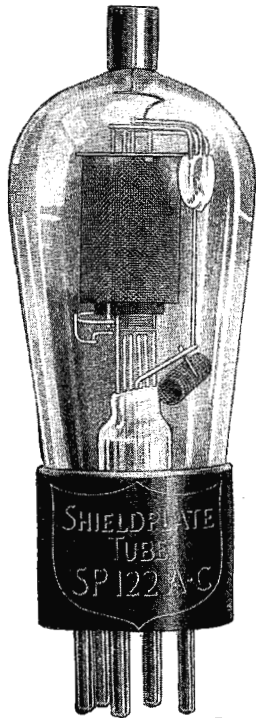
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SHIELDPLATE A-C TUBES



TYPE
SP 122 A-C

SHIELDPLATE SP 122 A-C Shielded Grid Amplifier Tubes are the latest development in radio. They are especially designed for use in the Tyrman Imperial "80," and make possible its wonderful performance. Here is a real long-life shielded grid A-C tube that is naturally rugged and dependable due to precision construction.

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Now you can be assured of better radio reception with the use of this new SP 122 A-C tube. SHIELDPLATE tubes are manufactured by the makers of the original and famous SP 122 SHIELDPLATE tube, which created a big sensation among radio engineers last season.

Price \$7.00 Each

Use "DIATRONS"—A Tube for Every Radio Purpose

Six Superior Features

1. Amplification constant is 300 compared with constant of 8 in general purpose tubes.
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3. It is self-neutralized.
4. Operates on 2.25 volts—A-C.
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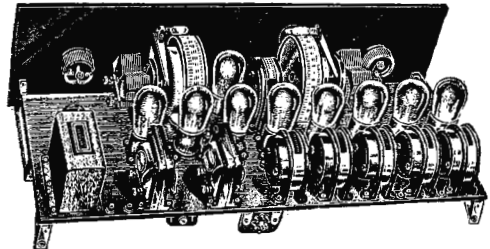
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After a Professional Set-Builder builds his first Magnaformer you cannot hire him to build any other Super. That's why the Magnaformer is far outselling other brands.

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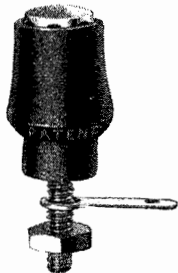
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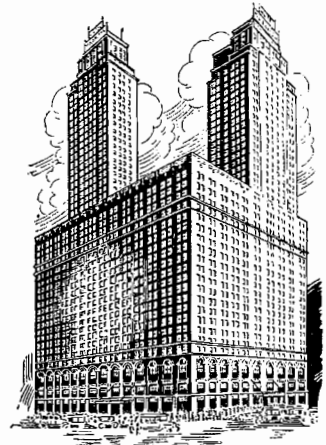
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Birnbach Acid-Proof Battery Cables



These battery cables are acid proof and are composed of Stranded Wires insulated with Colored Rubber and enclosed in an attractive Braid over all the wires. Furnished complete with brass soldered terminals for neat and quick attaching. Made in 5, 6, 7, 8, 9 or 10 wires, 54 inches long. For those

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A heavy duty Battery Cable for use with a storage battery. The wires for the A Battery are made of heavier construction and assembled with Storage Battery Clips. All wires are acid proof. Will not absorb moisture. Made in 5, 6, 7, 8, 9 or 10 conductors, 54 inches long or 10 feet long, as required.

Birnbach Battery Connector



A handy flexible connector for use with DRY Cell Batteries. Also for connecting the B and C batteries.

Birnbach Bakelite Tuner



Decidedly new and attractive, wound on genuine Colored Bakelite. Smaller in size, more room in your set, gives you better tone qualities, sharper tuning, more volume and greater distance. Covers the entire Broadcast bands. Made in two sizes for .00035 and .0005 mfd. Tuning condensers. A Radio Frequency coil is sold to match the Tuner. These coils can be used in any of the popular circuits.

to match the Tuner. These coils can be used in any of the popular circuits.

BIRNBACH COLORED EXTENSION CORDS harmonize with the color scheme in any home.

They are moisture proof and are available in convenient lengths, thus allowing you to place your speaker in any part of the home where acoustical reception is at its best.

Your dealer will be glad to show you a complete line of BIRNBACH PRODUCTS.

Birnbach "360" Tuned R. F. Kit

Kit consists of three matched coils, wound on Colored Bakelite. For use in any of the two and three tuned R. F. circuits. Cover the Broadcast bands when used with .00035 Variable Condensers.



New Birnbach Moisture Proof Extension Cords

The finest extension cord available. Attaches instantly. Made with strands of copper wires insulated with rubber with an outer brown covering of the finest mercerized braid. These cords are moisture proof, no leakage between conductors, no scratchy noises in the loudspeaker. With a Birnbach 10, 20, 30, 40, 50 or 100 foot Extension Cord you can move your loudspeaker to any part of the house.



Birnbach Colored Extension Cords in 20, 30 or 50 foot lengths in three popular colors, OLD GOLD, MAROON and WHITE in a beautiful silk covering for those who want the best. You can select a Birnbach Cord to harmonize with the color of the baseboard or moulding. These colored Birnbach Cords harmonize with any color scheme of home decoration.

Birnbach Replacement Cords

These cords are used in replacing worn out cords from head sets or loudspeakers. If your reception is interfered with scratching noises you need a new cord.



BIRNBACH PRODUCTS ARE GUARANTEED TO GIVE PERFECT SATISFACTION

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For Sale by Your Neighborhood Dealer



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**BEAUTIFUL, DURABLE
CELORON PANELS**
*Available for all the
POPULAR KITS
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HOOK-UPS*

Celoron Radio Insulation
MEEETS all insulation and modern production requirements.
Uniformity of quality and elegance of finish unsurpassed.

THE CELORON COMPANY
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**A Simple Guide
for Selecting
Resistors**

No matter how many claims are made for a resistor, you can always check up on its true worth by finding out who uses that particular make, and how it stands up under the rigid pressure of daily service.

We strongly recommend that you ask any one of the following companies about Harfield Resistors. They are but a few of a great number of concerns now purchasing Harfield Resistors in large quantities.

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Tell us about the resistor you want and we will be glad to make up samples for you with prices

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**HAR-FIELD
WIRE-WOUND
RESISTORS**

EBY SOCKETS



Bottom View, with base removed of UY socket showing contacts. Also available in UX type.

Eby Sockets have

- (1) Built-in Guide for tube prongs.
- (2) New and improved prongs providing long tight spring contact.
- (3) High current carrying capacity and low inter-electrode capacity.
- (4) Good looks—specially designed for A.C. tubes.



The new Eby tip jack is built to deliver a perfect contact. The tips are recessed so that phone tip can't move after insertion. Equipped with red and black washers for insulation.

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Complete Parts \$59.45



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BROWNING-DRAKE'S new kit bids fair to be as revolutionary as the original Browning-Drake four years ago. It is strictly modern in every particular. True single control, without trimmer condensers or antenna variometer has been accomplished for the first time with this circuit.

The remarkable performance of this new assembly can only be appreciated by those who have heard and operated one.

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At the Site of The Washington Elm

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'B' BATTERY ELIMINATOR

Only \$5.95

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No more worry with "B" Batteries! Hook up an R.B. "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set. Completely Equipped—No "Extras" to Buy Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed — anyone can plug it into any kind of set up to six tubes. Constant voltage gives set more power. Costs no more than set of good "B" Batteries. Solidly built in beautifully finished metal case, with genuine Bakelite top.

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Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance (\$4.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.

THE R. B. SPECIALTY CO.
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Ask for FREE circular about amazing, new "A" BATTERY ELIMINATOR offered at \$19.95 for limited time.

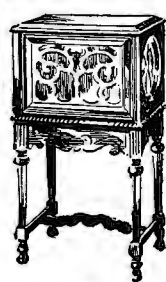
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110 volt, 60 cycle AC. Combining rectifier and power amplifier. Takes place of last audio stage in set. Handsome walnut cabinet. List \$175.



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Gracefully proportioned cabinet finished in light mahogany.
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Magnavox Dynamic reproduction is infinitely finer . . . richer, fuller, more realistic. . . Those who wince at distorted music or who must strain to hear other speakers clearly welcome the beauty and generous volume of Magnavox. That's why fourteen leading set makers have chosen it for built-in equipment.

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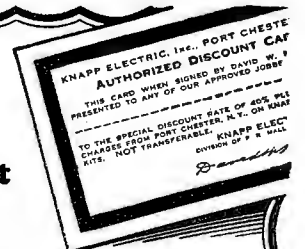


THE Shanco Clip design assures free and uninterrupted flow of electrical current. There are no springs to heat up, burn or drop out. Made of powerful tension, tempered spring steel solidly riveted together. All parts electro-plated before assembly (not galvanized or tinned), acid-resisting. The jaws open wide and are easily applied. The Griptite bulldog teeth "stay put" and bite right through corroded bars and terminals. The teeth are so arranged that the clip cannot fall over and "short" the battery.

There are 4 sizes for every battery need: 5 Ampere, 15 Ampere, 50 Ampere, 300 Ampere.

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It will enable you to purchase the New and Improved KNAPP "A" POWER KIT at a liberal discount

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TONE QUALITY

Even reproduction of the entire frequency scale.



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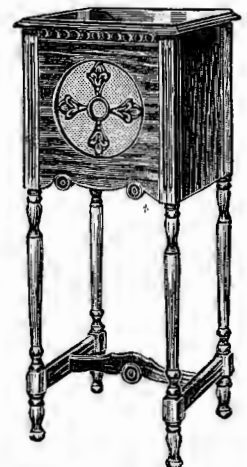
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Handles a Power Amplifier, using No. 250 Tubes. PUSH PULL in last stage.



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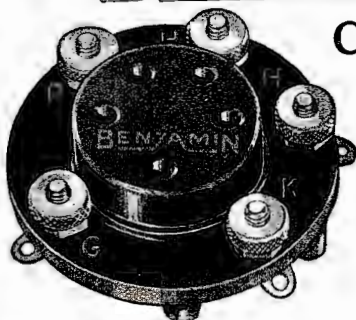
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BENJAMIN



Cle-Ra-Tone Radio Sockets

Spring supported, shock absorbing. The tube holding element "floats" on perfectly balanced springs. Reduces microphonic disturbances, tends to

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Y-Type, Green Top, for 5 Prong AC Tubes: For mounting on top of panel, \$1.00; for direct attachment to panel, 75c.

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A decided advantage for the neat and substantial construction of the set. Used when panel and sub-panel are assembled to make one complete removable unit. The Adjustable Brackets permit panels to be mounted vertically or at any desired angle. No. 8629—Rigid—70c per pair No. 9029—Adjustable—\$1.25 per pair

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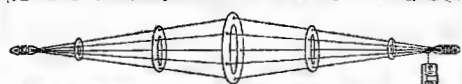
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No. 30



Length 30 ft. Non-corrosive—30 ft. length—volume of 150 feet aerial with selectivity of 30 foot antenna. Assembled—ready to string up—all connections soldered or riveted.

Guaranteed Double Volume and Sharper Tuning

Rings are heavy gauge solid zinc. Permits using a powerful aerial in 30 ft. space. Duplicates in design and material. The aeriels used by largest Broadcasting Stations. Sharpens tuning of any set, because of short length, but has enormous pick up because 150 ft. of enameled 12 ga. wire is used. Insures more uniform reception. Non-corrosive feature insures long life and 100% efficiency at all times. "Truly a Life Time DX Aerial." List..... **\$10.00**

No. 60—Length 60 ft. Price \$12.50

"Big Boy" size. Best for European tests. (Same description as above, except that 300 ft. of wire is used making this the most efficient and powerful aerial ever made.)

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Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

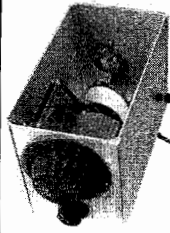
\$6.50 FREE \$6.50

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To introduce the MACK LABORATORY BOOSTER we are supplying the necessary SHIELDED GRID TUBE FREE. The BOOSTER is furnished completely assembled and wired in a standard Aluminum Co. of America shielded box ready to operate.

INCREASES VOLUME, BETTER SELECTIVITY, MORE DISTANCE

\$16.95 Complete



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EASILY APPLIED, NO CHANGES NECESSARY, NOTHING ELSE TO BUY

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Each BOOSTER complete with Tube and Battery Cable, ready to operate and guaranteed to improve the reception of your receiver.

MACK LABORATORIES
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Chicago, Ill.

THE MIRACLE OF THE RADIO WORLD!

Newest, Guaranteed 7-Tube, 1-Dial Console Set, Worth \$200.00

"Diamond" All-Electric Radio

At a Sensational Factory-Direct Price

30 DAYS' FREE TRIAL!

1929 MODEL BUY DIRECT!

Remember—30 days free trial. You be the judge! Worth \$200 and looks it! Only one dial to tune—Illuminated! Marvelous mellow tone. Selective and gets distance easily. The radio sensation for quality, price and performance. Mail coupon today for our big, money-saving Free Catalog, before you buy any radio or accessories!

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Our low factory prices on the complete line of Diamond Electric and battery operated radios shown in catalog will amaze you!

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Outperforms sets selling at 2 and 3 times our low price. Includes console set shown, made of combination walnut; A. C. electric set, all tubes, built-in magnetic speaker and aerial equipment, **COMPLETE. NOTHING ELSE TO BUY**

Only \$79.85

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Please send me your Free Catalog of Diamond radios and details of your 30 Day FREE Trial offer

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Write us for new illustrated Catalog "C-1" containing all the new and popular kits in radio. Our tremendous stock enables us to give you immediate service on all radio supplies at wholesale prices.

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AUDIO TRANSFORMERS ONLY 97c

This is the most amazing radio value ever offered. Think of it! A \$4.00 audio transformer—a genuine Illinois "all frequency" unit of the finest musical capability, offered direct from the factory for only 97c. Never before such a bargain opportunity. Thousands have bought them. Sold with a positive guarantee of satisfaction or money back. Supplied in ratios of 1 1/2 to 1, 3 to 1 and 5 to 1. Order now.

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Make \$5,000 to \$15,000 a Year

Operating a **Battery Service Station**

Tremendous profits easy for you to get charging batteries. Customers come right to your door. No soliciting—no hard work. Every time you connect a battery you make 90c clear profit. My Service Station Charger is years ahead of ordinary chargers. You can get all the business in your town. Start in your garage, basement, or rent a store.

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Dependable Parts for Modern Radio Sets

Junior Rheostats



Small in size, but a master instrument. Ask your dealer to show you the exceedingly fine adjustment and velvet smooth action. Diameter, 1-7/16 inches.

- Up to 400 ohms.....\$0.75
- 1,000, 2,000 and 3,000 ohms..... 1.00
- Potentiometers.....extra .25
- Self-attaching, positive-acting switches for Junior Rheostats......40

Colored Phone Tip Jacks



Have distinctive colored caps, red for positive side of loud speaker and black for negative side.

Cap is of Bakelite. Take standard phone tips. Phone tips nest all the way in jack, making excellent spring contact. Lessens danger of shorts. For Bakelite or metal panels.

- No. 422—Insulated Colored Phone Tip Jacksper pair \$0.25

- Phone Plugs**
- Automatic Power Relays**
- Air-Cooled Rheostats**



are the choice of the leading manufacturers of their most prominent and successful sets.



Radio Convenience Outlets

Enjoy your radio programs in any room in the house. Put the batteries in any out-of-the-way place. Bring aerial and ground connections to most convenient point. These outlets fit any standard switch box. Full instructions with each outlet.

- No. 135—For Loud Speaker Connections\$1.00
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- Also furnished in two and three plate gang combinations

WITH BAKELITE PLATES

Now furnished with a rich satin Brown Bakelite plate, with beautiful markings to harmonize, at 25 cents extra.

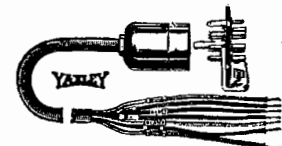
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Absolutely dependable. Run true to rating. Have convenient screw eye and soldering lug for easy mounting and wiring.

- Space wound, 1 to 60 ohms.....15c
- 100 to 400 ohms.....25c
- Tapped resistances, 6 to 64 ohms.....30c
- 100 and 400 ohms.....40c
- Grid resistances, 100 to 500 ohms.....25c
- 600 to 3000 ohms.....35c

Cable Connector Plug



Complete as illustrated with 5-foot cable and cable markers.

Mounting plate mounts on base panel by means of bracket. Bakelite construction; positive spring contacts; no loosening of pins or springs in soldering. You cannot put the Cable Connector Plug together improperly. All terminals and cable ends plainly marked.

- No. 660—Complete\$3.00

- Cable Markers**
- Panel Lights**
- Jack Switches**

Yaxley Mfg. Co.

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\$2

Amazing Discovery For Any Radio

SATISFACTION GUARANTEED

Get Distance

Why confine your radio programs to a few local stations when the expensive concerts, dance music and lectures of hundreds of big cities are ready for you? With every order for our treatise, "The Distance Getter," we include FREE our wonderful new Distance Transformer. Tune your set according to our special instructions and presto—note the distant stations roll in!

Your money instantly refunded if you are not satisfied. The attachment furnished free with the "Distance Getter" alone is worth the price. Results beyond all expectations. Outta thru local stations like a knife," writes Galloway of Chicago, Ill. "Send three more for my friends. I get Denver and Calif. easily," says Homes, Palos, Ill.

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Send me Distance Getter, postpaid. Enclosed find \$2.00 (M.O., stamps or check). Send C.O.D. plus small postage added. Also send 100-page Radio Catalogue Free.

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Write today for our large illustrated new Catalog "C-1," showing how this organization of men with years of experience, can give you personal service.

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JEEMS SUPER TROUBLE SHOOTER

The Easy Method for Locating Trouble in Your Superheterodyne

THIS

handy chart, comprising 16 symptoms, 130 possible causes, is highly recommended by professional set builders as a valuable asset in the work shop.

Accurate, Sure, Complete, Practical

By Mail, 50c

Roberts Radio Service

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**Take the Advice of
Leading Radio
Service
Organizations—
Play Safe with
PAR VOLTS**

IF you want the real truth about condensers go to an organization that builds, services and repairs every type of radio receiver and power supply unit. Absolute safety is vital with a firm doing a large volume of service work.

Mr. Frank McDonell, of the nationally-known house of Rositer, Tyler and McDonell, says: "We think so well of ACME PARVOLT Condensers that we have samples constantly on display for all clients to see. Those of our customers who know radio also know that PARVOLTS are thoroughly reliable. We like our clients to realize that we use the best in radio."

Don't take chances with condenser break-down. Play safe with ACME PARVOLTS, made by The Acme Wire Co., New Haven, Conn.



ACME PARVOLT FILTER CONDENSERS—Supplied in all standard mjd. capacities for 200, 400, 600, 1000, and 1500 Volt D. C. requirements. Uniform height and width for easy stacking. Supplied singly or in complete housed blocks for the important power supply units such as Thordarson, Samson and others.

ACME PARVOLT BY-PASS CONDENSERS are supplied in all standard mjd. capacities and for all required working voltages.

**ACME PARVOLT
CONDENSERS**

REAL SPECIAL OFFERS!



UNI-RECTRON POWER AMPLIFIERS
(Ideal for Use with Dynamic Speakers)



As the Uni-Rectron stands it is a super power amplifier, which can be used in connection with any radio set and loud speaker. Binding posts are provided for input to the Uni-Rectron and output to the speaker. Requires no batteries for its operation. It obtains its power from the 110 Volt, 60 Cycle alternating current lighting circuit of your house.



MODEL AP-935
LIST PRICE \$88.50
(without tubes)

Special \$19.75 EA.

The UX-210 super power amplifying tube and the UX-216B or 281 rectifying tubes are used with this amplifier, which cannot overload. From the faintest whisper to the loudest crash of sound—R. C. A. Uni-Rectron amplifies each note at its true value. High and low notes are all treated alike.

The volume and quality delivered will be a revelation.

THE NEW GOULD KATHANODE UNIPOWER
(With Built-In Relay)

Automatic Radio "A" Power from Your Light Socket

LIST PRICE \$39.50 EA.

Model AC-6-K (6 Volt) Kathanode Unipower is the highest quality "A" Power Unit built. Furnishes rich, smooth, unflinching "A" current without any trace of hum for the largest power tube sets, which is automatically replenished from the light socket. Installed in less than three minutes, makes any set as simple and convenient to operate as an expensive A-C outfit at only a fraction of the cost. No rewiring necessary in your set.



SPECIAL
\$13.75 EA.

Its Kathanode construction insures longer life and freedom from service expense

and when sold it will take care of itself. It is very economical and will outlast several storage batteries. Its Kathanode construction is an exclusive patented feature, being used by the U. S. Government in their submarine batteries, which are furnished by Gould.

Equipped with a new noiseless Balkite Charging Unit, which has four graduated charging rates and in addition one booster rate (1 1/2 amperes) for an emergency charge.

All the Above Units Are Brand New and Packed in Original Factory Cartons

SEND FOR OUR LIST OF RADIO BARGAINS

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TUBES last longer when their filament temperature is controlled by AMPERITE, which is the only self-adjusting tube control. Entirely unlike fixed resistors. Keeps tubes burning at their rated voltage, despite "A" current variations—protects against blow-outs—gives clearer reception and easier tuning. Insist on AMPERITE. A type for every tube—battery or A.C.

\$1.10 with mounting (in U. S. A.) at all dealers.

Radiall Company
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FREE—"Amperite Blue Book" of new circuits and construction data. Write Dept. C.R.11.

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The "SELF-ADJUSTING" Rheostat

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Dept. 16, American Radio Bldg., K. C., Mo.



VEE Loop—VEE Screen Grid Kit

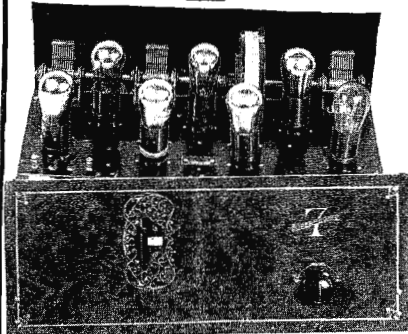
The VEE Coil Antenna has been still further improved in beauty and in performance—sharper directional ability, keener selectivity, greater pick-up. Send for special folder or ask your dealer.

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Radio's
greatest
value!

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SUPERPHONIC



7 TUBES
SINGLE DIAL

Only
\$16.95

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Superphonic 7 is a world beater! An exceptionally high grade receiver that is amazing the Radio World. Latest 7 tube tuned radio frequency circuit, using 4 radio frequency amplifiers, detector and 2 stages of audio. Power tube can be used in last audio stage. Extremely selective, marvelous sensitivity. Single drum dial control. Straight line wave length condensers permit accurate, equally spaced tuning over entire wave band. All sockets spring cushioned to eliminate microphonic noises. Bakelite subpanel (8 3/4" deep) insures minimum dielectric losses. Clear and realistic reception guaranteed. An exceptionally beautiful, walnut finish, metal front panel 7"x18". Complete chassis. No extra parts to buy. All parts mounted ready to wire. No special tools needed. All hook-up wire and colored battery cable included. Value \$60.00; our price **\$16.95. TESTED AND APPROVED.** Severe laboratory tests have proved the remarkable efficiency of this set. Owners everywhere are sending us letters praising its wonderful receptive qualities.

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Very easy to wire this set with the instruction we furnish. Just connect a few wires. All you have to do is to follow numbers. Simple as adding 2 and 2. Can be wired in a few minutes by anyone. No radio knowledge needed. Make money by wiring these sets in your spare time and selling them to your friends.

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RADIO EQUIPMENT COMPANY

549 S. Wells St., Dept. 30-E Chicago, Ill.

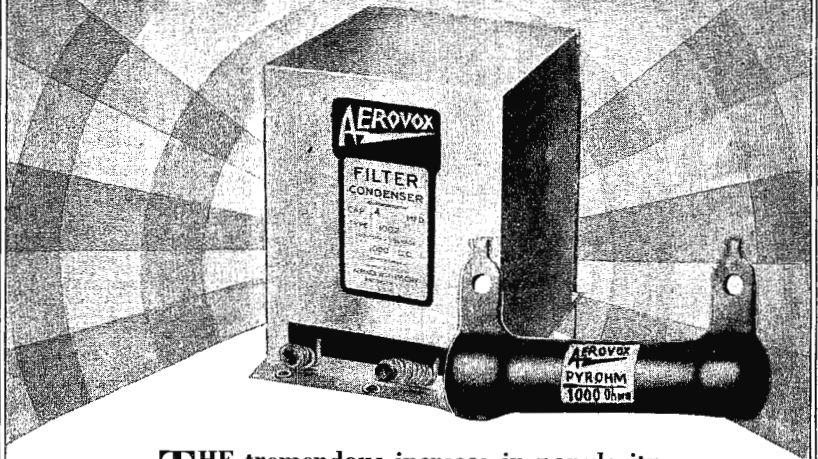
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Aerovox condensers and resistors are meeting the most rigorous tests imposed by modern power equipment. They are built to stand up under the severest service conditions.

Write for "The Research Worker," a free monthly publication that will keep you abreast of the latest developments in radio.

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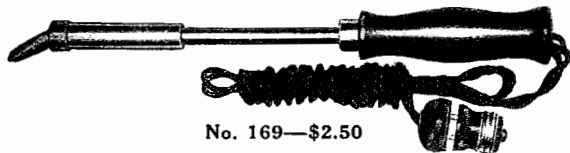
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No. 169—has standard Ward Heating Element, 6 feet of Flexible Heater Cord, Highly Nickered Parts— $\frac{3}{8}$ in. Diamond Tip (screw driver tip optional). Point swivels to 45° angle, permitting difficult soldering operations. Exclusive patent.

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KI-LOWAVE ADAPTER

TESTED!

Instantly converts any set AC, Battery or Eliminator operated type into a short wave set, by simply inserting Adapter Plug in place of a tube.



PROVED!
 No extra tubes, batteries, etc., required. No change in wiring of set necessary. Furnished with three plug-in coils, wave-length range 14 to 96 Meters, which includes practically all of the high power Short Wave Stations

Bring Your Set Up-to-Date with a Short Wave Adapter
 Amazing distances have been covered on Short Waves. It is not unusual for listeners to hear England, Holland and others, as well as the U. S. Short Wave Stations. The thrill of listening to real DX reception is yours with KI-LOWAVE ADAPTER attached to your set.

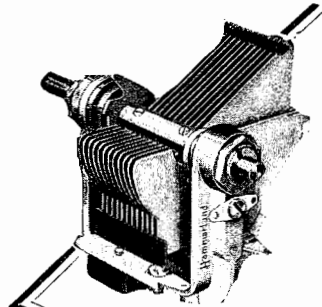
Guaranteed to operate on your set. Ask your **\$19.50** Prepaid dealer or order direct—price..... *Anywhere*

When ordering mention type of set used, whether AC (ALL ELECTRIC) or DC (Battery or Eliminator) operated type. Literature on request.
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Genius in the Great New "Hi-Q" Receiver

Is Expressed in Its



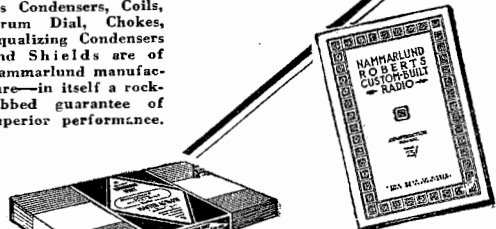
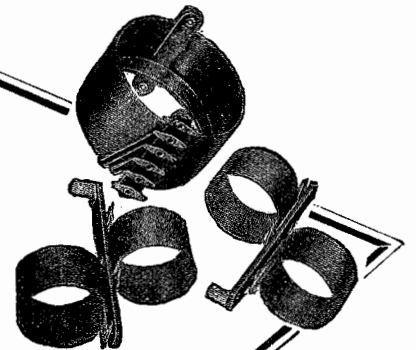
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Receivers come and receivers go—but you have a better "Hi-Q" every year.

The Hammarlund-Roberts "Hi-Q 29" attains a degree of efficiency surpassing its predecessors. Knife-like selectivity—all of the volume you can use—and quality of tone that charms.

Four models—"Master" and "Junior," for either A. C. or D. C. operation.

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Send 25c for the Hammarlund-Roberts Manual. It tells the whole "Hi-Q" story—how to build and operate this ultra-modern receiver.

Your dealer can supply you with the "Hi-Q 29" Foundation Unit for any of the four models. It includes drilled and engraved Bakelite panel, steel chassis, aluminum shields, shafts, wire, screws and all special parts.

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**Radio
Electrical**

**Potter
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**POTTER T-2900
CONDENSER BLOCK**
used in the single 250 type tube amplifier using two 281 type rectifier tubes, \$20.00.

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used in the push-pull power amplifier with two 250 type tubes, using two 281 type rectifier tubes arranged for dynamic speaker operation, \$22.50.

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used in "B" eliminators and power packs arranged for an output for the 171 type power tube, \$12.75.

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used in power packs designed for operation with the 210 type power tube, \$15.50.

**QUALITY LONG LIFE
UNIFORMITY ECONOMY**

Insure the perfect operation of that power amplifier and electrically operated radio set with the use of Potter Condensers.

There is a Potter Condenser made for each requirement and should be selected with care to give troubleless operation.



POTTER EXTRA DUTY CONDENSERS
The resistance of this condenser is high and permanent, which gives no current leak. The radio frequency resistance is low so as to pass all effective currents. Material carefully selected to maintain minimum heat losses. Each condenser tested with 2000 volts direct current.

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A National Organization of Your Service



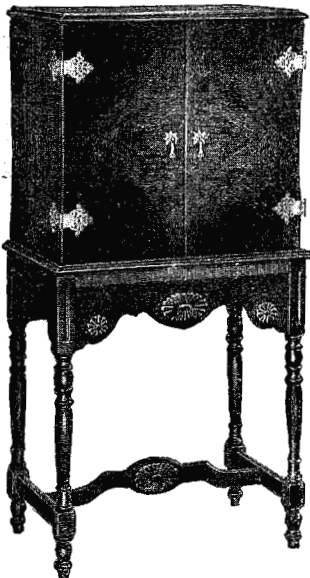
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the remedy for man made static.

It is no longer necessary to have broadcast programs spoiled by interference from oil burners, ice machine motors, violet rays, vacuum cleaners, drink mixer motors, fans, etc.

ENJOY your radio programs by the use of a **POTTER INTERFERENCE ELIMINATOR**, connected to the electric circuit at the point where the interfering device is connected. **POTTER INTERFERENCE ELIMINATOR** effectively drains the disturbance and prevents its reaching the radio set.

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DESIGNED especially for Atwater Kent, Crosley and other standard A. C. receivers. Accommodates set and speaker in a beautiful cabinet of highest quality of Excello craftsmanship. Doors five ply, matched butt walnut veneer; fold back flat against sides. Receiver compartment in sliding drawer.

Walnut hand-rubbed finish.

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**EXCELLO
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CAN YOU SELL GAS at 5c PER GAL.?

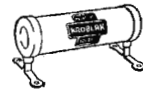
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Cord Type
Standard Modu
Plug\$2.50

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Mere reception of a radio signal is not enough. It has ceased to be, "How many stations did you get?" The thing of importance today is "How well did you get them?"

There are two major operations in tuning a set: locating the station—and *modulating* it to obtain the best quality of tone.

The Centralab Modu Plug is the perfect volume and modulation control. With it, all the true beauty of tone and naturalness of speech reproduction can be obtained.

It is attached to any set in a moment without additional wiring or complicated connections. Equally as adaptable for volume control on phonograph pick-ups and speakers remote from the set.

An interesting book full of picture and wiring diagrams showing the use of Centralab Volume Controls and Resistors is yours for the asking.



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12 Keefe Avenue Milwaukee, Wis.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

OF CITIZENS RADIO CALL BOOK MAGAZINE AND SCIENTIFIC DIGEST, published four times yearly at Chicago, Illinois, for October 1, 1928. State of Illinois, County of Cook, ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Chas. O. Stimpson, who, having been duly sworn according to law, deposes and says that he is the Editor of the CITIZENS RADIO CALL BOOK MAGAZINE AND SCIENTIFIC DIGEST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Citizens Radio Service Bureau, Chicago, Ill.; Editor, Chas. O. Stimpson, Chicago, Ill.; Managing Editor, Fred A. Hill, Chicago, Ill.; Business Manager, D. H. Bell, Chicago, Ill.

2. That the owner is (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given): Citizens Radio Service Bureau, Chicago, Ill.; (Chas. O. Stimpson, Chicago, Ill.; D. H. Bell, Chicago, Ill. H. Anbeiser, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are (if there are none, so state): There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (this information is required from daily publications only).

CHAS. O. STIMPSON,
Editor.

Sworn to and subscribed before me this 1st day of October, 1928.

(SEAL) (My commission expires July 25, 1932.)

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Price, \$7.00

THE Type 585 Amplifier Transformers are designed particularly for those desiring the best in transformer design. Due to the use of adequate quantities of silicon steel as a core material precautions against overload are not necessary as in the case of nickel alloy cores. The electrical characteristics of the Type 585 Transformers are listed below.

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	TYPE 585-D	TYPE 585-H
Primary Inductance.....	79 Henrys	71 Henrys
Primary D.C. Resistance.....	2000 Ohms	2000 Ohms
Secondary Inductance.....	316 Henrys	866 Henrys
Secondary D.C. Resistance.....	9300 Ohms	11,000 Ohms
Amplification Ratio.....	1:2	1:3.5
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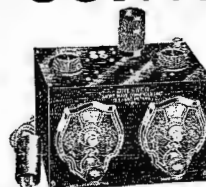
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DRESNER SHORT WAVE CONVERTER

Wave Length
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**15 TO 550
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**COMPLETE
\$22.50
SPECIAL**

Some of the best entertainment of the air is broadcast on the short waves by many powerful stations. There is no longer any reason why all should not receive these excellent programs from all over the world. The Dresner Short Wave Converter Unit is completely assembled. It efficiently covers a wave band of 15 to 550 meters, and makes reception easily obtainable for all. Offered at the special price of \$22.50—complete ready to plug into your receiver in a few seconds. If your dealer cannot supply you **SEND MONEY ORDER DIRECT** and we will ship P. P. prepaid. **GUARANTEED.**

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Van Ashe makes set-building profitable as well as pleasant. Our big discounts make money for you on every kit or part you buy. And 12-hour shipment is our regular rule. To get the most out of set-building, see our new catalogue for:

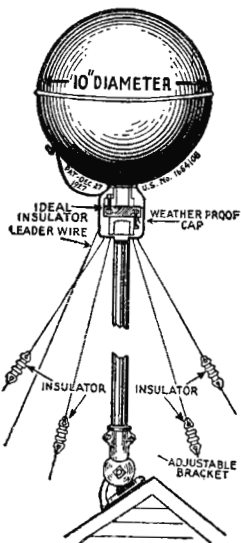
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BUILT TO ENDURE AND SERVE—

From amateurs to experts—from the first year radio became generally popular until today, Amsco Condensers have been the universal choice whenever and wherever quality construction and permanent performance were demanded.

Now comes the Amsco "Bath-tub" type. This new Amsco feature saves time in assembling, saves space, and assures greater rigidity and finer accuracy in single control tuning. Adopted by the largest manufacturers of sets and kits and specified in all leading circuits.

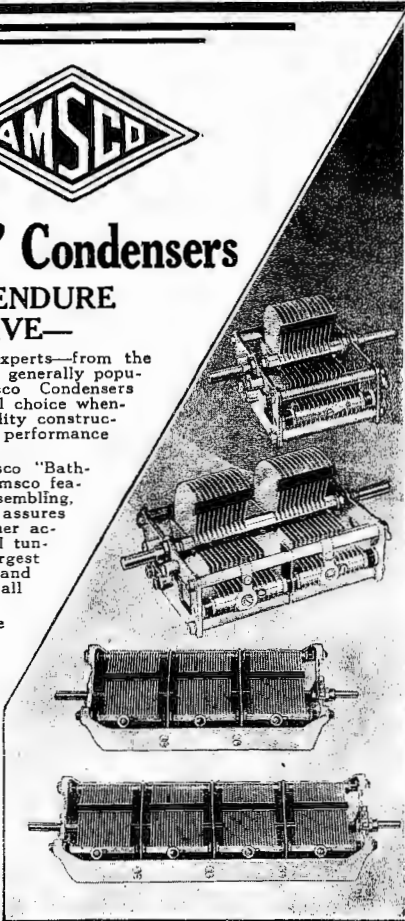
We can give you these new "Bath-tub" types in double, triple and quadruple combinations.

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If your dealer cannot supply you, write us for complete descriptive literature and prices.

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BALDWIN Regular
Famous Type C
HEADPHONES



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BALDWIN HEADPHONES

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Best of All

Your present radio receiver, whether battery operated or all electric, will bring in short wave broadcasting when used with



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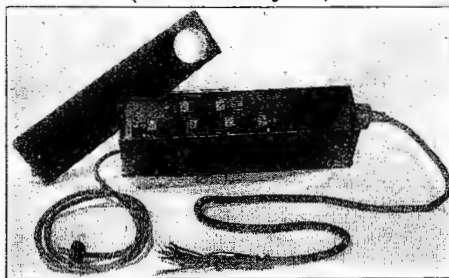
20 to 65 meter range—for battery operated radios, \$15.00. For all electric radios, \$17.50. 12 to 180 meter range—for battery operated radios, \$22.50. For all electric radios, \$22.50. 12 to 180 meter range models have interchangeable coils.

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with
Arcturus A-C Super-Filter
(25 or 60 Cycle)



(15"x5"x3 1/4")

YOUR experience in radio has shown you that Quality Equipment Pays! When **QUALITY** is combined with reason in price, your interest is aroused.

The **SUPER-FILTER PACK** incorporates complete Power-Supply and conversion for A-C Sets, including facilities in the pack itself. The price is **\$40.00**, including Jones Cable and Multiple Plug. One 280 Type full wave rectifier tube required. We supply A-C Packs, to handle all types of tubes.

State whether or not you are a Dealer

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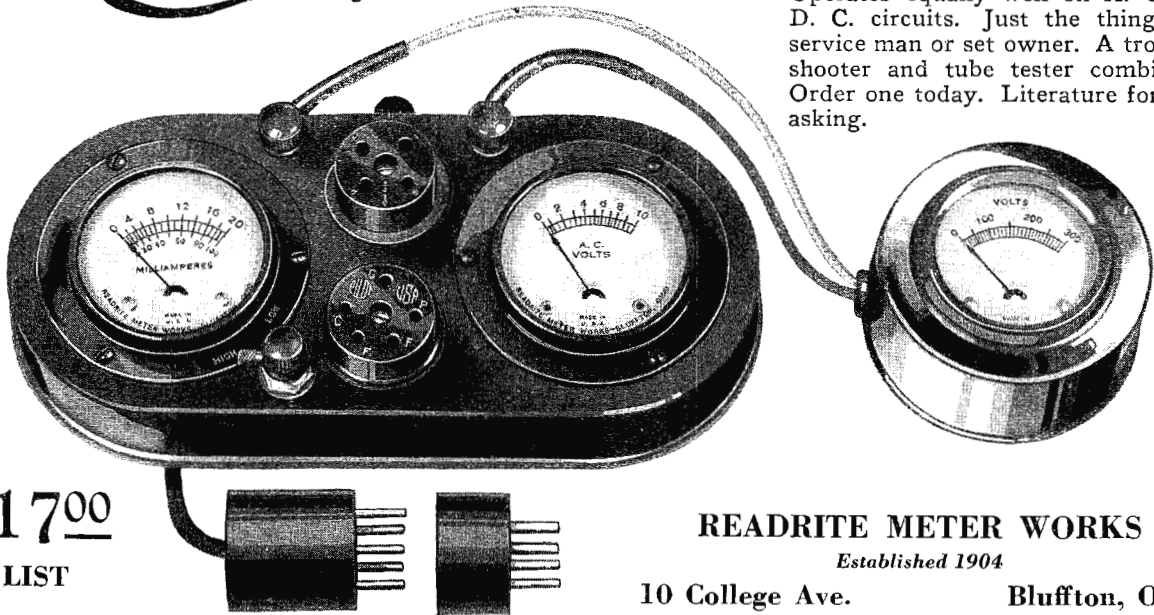
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Universal Test Set

Complete Outfit, Shown One-Half Scale

Operates equally well on A. C. or D. C. circuits. Just the thing for service man or set owner. A trouble shooter and tube tester combined. Order one today. Literature for the asking.



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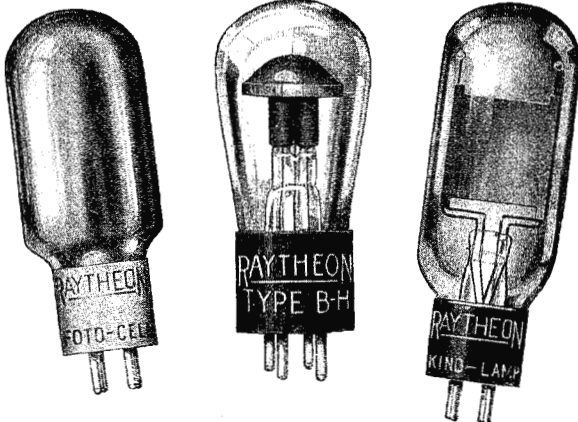


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A television sending tube in hard vacuum or gas filled types.

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The long life rectifying tube.

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The television receiving tube adapted to all systems.

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Enabling you to purchase the new and Improved Knapp "A" Power Kit at big discount—Write for full particulars.

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Over 60,000 Townsend "B" Power Units Now in Use -- they must be good!

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Utmost economy and convenience. Plug into light socket and forget it. Delivers up to 100 volts on any set on D.C. or A.C.—any cycle. YOU TAKE NO RISK. Sold on real GUARANTEE—it must satisfy or money paid us will be returned.

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Complete
\$6.85
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 Balance C.O.D.

APPROVED
 and passed by the rigid laboratory tests of "Popular Radio" and "Radio News."

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The Eliminator received from you about a year ago has proved a great success on my RADIOLA.
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Attach only \$1.00 to this coupon

10-28
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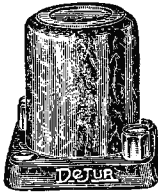
Western Radio Mfg. Co., Dept. C-2, 128 W. Lake St., Chicago

FREE AC CATALOG

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DeJUR

RADIO ESSENTIALS



The DeJur line of radio parts is the most complete and diversified in the industry. Whenever you need anything from the smallest part to the largest unit in a receiver, go to your dealer and ask him to show you the DeJur line.

We are the largest and oldest manufacturers of high grade radio parts. Our experience assures you quality. Our larger output and manufacturing facilities assure you lower prices.

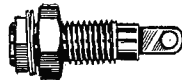
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DeJUR PRODUCTS

199 LAFAYETTE STREET, NEW YORK CITY

MASTER Voltage Control

Protects AC Tubes from High Voltage

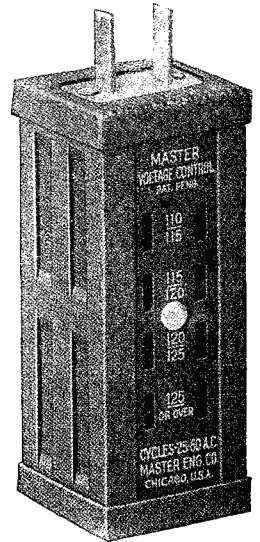
This voltage regulator (patent pending) is a necessity on all A-C sets. It protects A-C tubes from burning out by reducing excessive line voltage to the proper value.

Anyone Can Install It!

MASTER VOLTAGE CONTROL is simple to install. Requires no guesswork in setting for proper voltage. Has NO moving parts, therefore nothing to get out of adjustment or wear out.

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Simply call up the power company and ascertain the maximum line voltage in your district. Plug your A-C set into the marked outlet of MASTER VOLTAGE CONTROL to correspond with that line voltage. These various line voltages are clearly indicated at each outlet so that the proper setting may be had. Then plug MASTER VOLTAGE CONTROL into any convenient light socket. No volt meters, no tools or a service man's time is required for installation. Once installed it requires no further attention. To get proper life out of A-C tubes and keep them from burning out, use a MASTER VOLTAGE CONTROL.



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Dongan Electric Manufacturing Company
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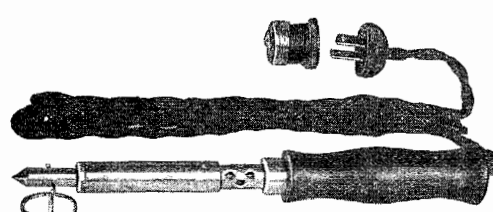
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**A most useful household article.
 Can be used to solder anything
 that requires soldering**

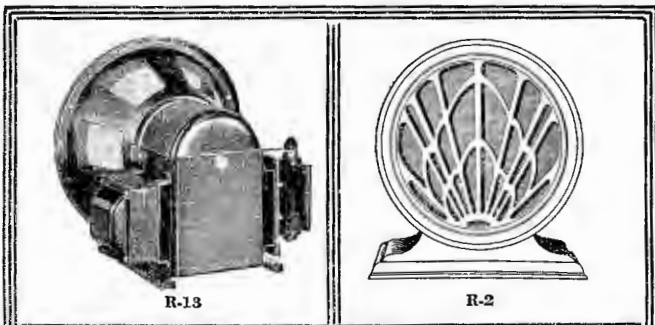
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BUY a Sterling Dynamic Speaker Chassis for your radio—fits all cabinets. Engineers—absolute pioneers in the dynamic speaker field—designed Sterling Dynamics. Sterling's 23 years of precision manufacture guarantees quality. 110-volt, 60-cycle, as shown, chassis only, \$40.00.

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The Sterling line includes Dynamic and Vari-tone Speakers, Speaker Chassis, Power Units, Amplifiers, Voltage Stabilizers, Testers and Meters. For sale at all good dealers.

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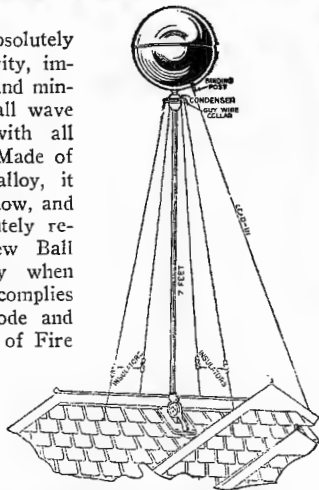


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THE New Ball Aerial absolutely gives increased selectivity, improves summer reception, and minimizes static. It receives all wave lengths, and functions with all makes of receiving sets. Made of non-corroding aluminum alloy, it is impervious to ice and snow, and gives a lifetime of absolutely reliable service. The New Ball Aerial functions perfectly when only ten feet apart, and complies with National Electric Code and rulings of National Board of Fire Underwriters.

A live selling proposition for dealers. Investigate it today. List price.....\$ 4 75 East of the Rockies West of the Rockies, \$5.25



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The Super Ball Kit contains all materials and accessories for complete installation—standard merchandise of the best quality. Included are—50' No. 14 Lead-in Wire; 50' Guy Wire (Copper); 7' 3/8" Conduit Pipe; 1 Super-Ball Antenna Base; 1 Super-Ground Clamp; 1 Lead-in; 4 Nail-It Knobs; 4 Eye Screws; 4 Insulators; 4 Screws.

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New hook-ups. This book shows how to make Short Wave Receivers and Short Wave Adapters. How to use the new screen grid tube in D. C. and A. C. circuits.

How to Build Power Amplifiers and ABC Eliminators. Up to the minute information on all new radio developments. Set Builders, Fans, Dealers, send for it today!

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THE first complete Kit. Furnished with either T-24, T-36 or T-48 Scanning Disk, Motor, Bushing, Rheostat, Daven Television Tube, 3 Complete Stages of Daven Television Amplification and Instructions for Building. Daven Television Receiver, Complete, including Television Tube—\$100.00 (Less Amplifier Tubes).



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Daven Television Scanning Disk		Daven Telev. Photo Elect. Cell 1 1/2" Bulb.....	\$20.00
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MOLDED WOOD TONE CHAMBERS FOR PERFECT RADIO RECEPTION!

The tone chamber or exponential type of speaker has proved to be the most efficient means for reproducing all notes—high or low—without distortion or overtones.

Molded Wood Tone Chambers are available in several sizes and each comes mounted in a light weight box that fits neatly into cabinet or can be placed where desired—no mounting problems—a child can install.

No. 595—with 8 ft. air column—size 21 x 18 x 15". Price \$18.

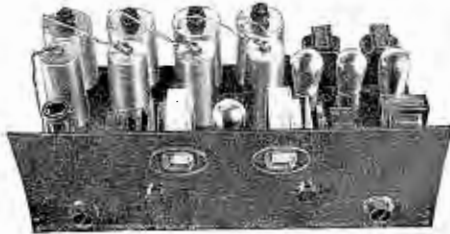
No. 570—with 6 ft. air column—size 15 x 12 x 12". Price \$13.

Write for prices on other sizes and detailed information regarding "Green-Cap" unit.



MOLDED WOOD PRODUCTS, Inc. 219 W. Chicago Ave. Chicago, Illinois

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**Tunable Intermediate Units
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THE new Braxton King is radically different both in the circuit used and in the design of the intermediate coupling units. The TUNABLE Intermediates permit an accurately matched I. F. amplifying system that will produce a maximum of amplification and selectivity. The extraordinary advantages of this exact matching can only be appreciated by comparing the Braxton King with receivers of conventional design. Send for complete description of this remarkable receiver.

Braxton-King TUNABLE Intermediate Units
Set of four, \$25.00

NOTE: We are prepared to convert your present super into a Braxton King Shield Grid Eight, utilizing all of your present parts with exception of the I. F. transformers and oscillator coil. Write for prices on this special work.

MISSISSIPPI VALLEY RADIO COMPANY
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Type PL-1152 especially designed for the Thordarson 250—2 Stage Power Amplifier and Plate supply, and Thordarson 250 Plug in Power and Plate Supply. Used with Thordarson T-2900 Power Supply Transformer.

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The condensers on a dealer's shelf look very much alike. The sly manufacturer is wise enough to make his product look like the best—but he cannot put the "guts" into it and charge the low prices he does.

The name Dubilier on any condenser is your safeguard. You know that Dubilier condensers are honestly made with oversized capacity and a factor of safety that has made them the standard of the leading manufacturers.

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"A Moulded Bakelite Product"

A simple device plugged into any light socket—does away with aerials and lightning arrestors. Guaranteed to work on your set. No current consumed. Sold by good dealers on a 5 day, money-back basis. Price \$1.50

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X-L LINK New!

The Only Unit That Completely Links
the Radio Receiver to the Light Socket

The new X-L Link makes possible the operation of a radio receiver entirely from one wire leading to the light socket, eliminating all other connections to the set whatsoever, and protects the tubes and parts of the set from injury.

It combines the following—

Antenna and Ground
(Using the shielded light wires; increases selectivity and reduces all types of interference.)

Line Voltage Regulation
(Protects tubes and set from line voltage surges and prolongs life of tubes indefinitely.)

Double Socket Outlet
(For set and dynamic speaker, or power units if used; switch controls dynamic speaker.)

Complete Fusing
(Eliminates fire hazard and protects delicate instruments of set from burn-out.)

Control Switch
(Exclusive feature. Turns dynamic speaker on and off and controls set if power units are used.)

Made with buffed silver finish and brown bakelite trim. Beautiful in appearance and performance. Unqualifiedly guaranteed by the makers of X-L Vario-Denser.



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A specially treated Wood Panel, furnished either PLAIN, TWO-TONE with VEIN, or TWO-TONE with INLAID BORDER (as illustrated), also in DELUXE STYLES, drilled and lettered as

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Guaranteed

BY THE LARGEST AND MOST UP-

This highly efficient organization with trained service men, together with a completely equipped laboratory, is at your disposal for repairing, testing and advice on all types radio receivers, battery eliminators and power units. Our experience in this field has helped all our clients to enjoy better and continuous radio reception. All laboratory instruments used in testing and repairing are modern and up to date, insuring rapid and accurate location of trouble involved in your receiver.

Remember

the confidence of many leading manufacturers has been placed in this laboratory. The Radio Service Laboratories will give to you the same conscientious service that the manufacturer himself would give you.

Any receiver or power device repaired by us is positively guaranteed to perform in the manner claimed by the manufacturer.



Because the largest staff of trained service repairmen and engineers are at your service, you can be assured at all times of the most careful and competent work. This is proven by the large numbers of sets shipped to us for service from every state in the U. S., Canada, Alaska and Mexico.

We Specialize

on all receivers illustrated in the Citizens Radio Call Book. If you have constructed any of these receivers and are not obtaining satisfactory results, let us give an estimate for putting the set in first class condition. Each receiver repaired by us is given a thorough inspection of each individual part.

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Service Includes Chicago and Surrounding Suburbs

We have a corps of specially trained service men ready to call at your home to service your radio receiver and accessories.

These service men have been carefully trained in this laboratory to be familiar with all types of receivers and power units. Each service man is completely equipped with laboratory instruments so that he may in a scientific way rapidly locate and correct the defects in your radio.

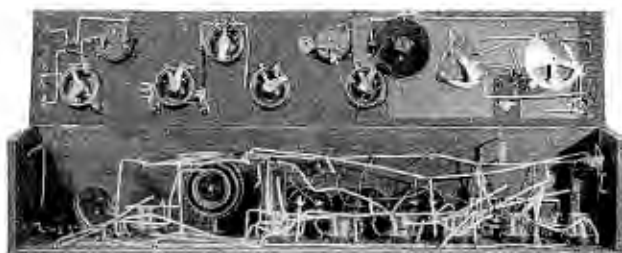
RADIO SERVICE

508 South Dearborn Street

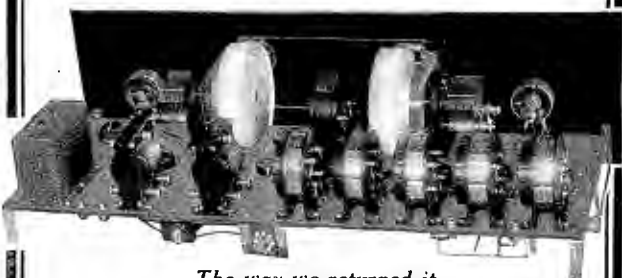
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Radio Service

TO-DATE SERVICE STATION IN AMERICA



The way it came in



The way we returned it

WE will repair, test or design any type of receiver you may desire. Being specialists in this field we are in an excellent position to rebuild your present receiver and bring it up to date.

It is more practical and wise to bring your problems here than to some irresponsible radio man who is unfamiliar with the merchandise you wish serviced. This is an era of specialized effort and our charges are no more than you would pay for inferior workmanship.



(All receivers serviced in this laboratory are given a final test in a completely shielded room where the internal noises are absolutely eliminated.) This insures noise-free reception, which is necessary for satisfactory performance. In addition, complete equipment is available for properly testing all types of power units.

If you are unable to personally deliver the receiver or unit you wish to have repaired, securely pack it in a strong box with plenty of cushioning material such as excelsior, and ship it to us via American Railway Express, prepaid. It is not necessary to ship the cabinet or accessories.

In order that you may safely ship your receiver to us for repairs, we can supply you with a strong fabricated carton, including the required amount of packing, sealing tape, wrapping paper and rope at a cost of \$1.00. This carton conforms to the construction requirements of Consolidated Freight Classification, a resistance of 200 pounds per square inch and a gross weight limit of 65 pounds.

LABORATORIES, Inc.

Harrison 2870

Chicago, Illinois

Getting the Most Out of Your Radio Set

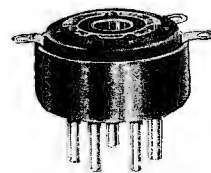
NA-ALD Is Building a Related Line of Radio Accessories to Help You to Get Better Results from the Set You Own—the Set You Build, or the Set You Buy. Read About the Accessories Below—Write for the Complete NA-ALD Catalog



With NA-ALD accessories you can put power tubes in your set—convert your battery set to an AC set—prevent your set from oscillating (or squealing)—put battery type tubes in dry cell sets—make battery sets portable using dry cell tubes—attach electric pickups to AC or DC sets—make your radio set electrically amplify music from your phonograph, greatly improving its tone quality—stop microphonic noises in tubes in your set, and a host of other things.

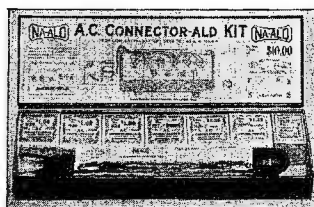


NA-ALD makes adapters for attaching power amplifiers to sets. The No. 933 will attach such amplifiers as Samson, Amertran, Newcombe Hawley, Powerizer, etc. The 947 will attach Radiola No. 16, 17 and 18, or any other battery or AC set to the Victor Electrola, Panatrope, etc. The 947 is made for and approved by the Victor Talking Machine Company. They will send you instructions for installing this adapter with the Electrola or you can get them from any Victor dealer.



No. 933—Price \$1.50

If you now have a battery type set and want to bring it up to date and get better quality and more stations, convert it to an AC set with NA-ALD AC CONNECTORALDS. This can be done in a few minutes and inexpensively with a NA-ALD AC Kit, a filament transformer and a set of the new AC tubes. Any standard B eliminator can be used or if desired B batteries can be used for B supply.



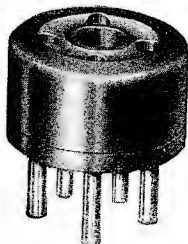
No. 906—A.C. Kit—\$10

A complete circular on converting battery sets to AC sets will be sent on request. (Don't scrap your set—convert it to an AC set.)

Many old sets are not wired for a power tube but power tubes can be put in any set with NA-ALD power tube CONNECTORALDS. Power tubes will give greatly improved quality and cost very little to install. No set should be without one.



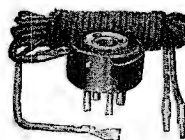
No. 112 Price \$1.50



No. 945—Price \$1

For testing sets and tubes NA-ALD has a complete new line of adapters. With them you can test AC tubes or AC sets with DC testers—test dry cell tubes in battery type testers, or in fact convert any tube socket to take any type tube. There are over thirty NA-ALD adapters. If you can't find the one you want—ask for it. Get the NA-ALD adapter catalog.

Note—Dealers Using Letterhead and Giving Jobber's Name Allowed Regular Discounts



No. 947—Price \$1.50

Several NA-ALD adapters are made for attaching Electric Pickups to Radio sets—Nos. 948, 946 and 949 all do this. The No. 949 illustrated is universal for AC and DC sets—it costs only 60 cents and illustrates clearly the simplicity and far-sightedness of NA-ALD engineering.



For A.C. or D.C. Sets No. 949, Price 60c



No. 5041—Price \$2.00

The NA-ALD Midget Speaker is an ideal little fellow for using when tuning in late at night—for the sick friend in the hospital—for surprising your friends by putting in a flower vase on the dinner table and connecting to set—and as a prize "It speaks for itself"—over 40,000 in use. You should have one.

ALDEN MANUFACTURING CO.		Dept. CCB4
Brockton, Mass.		
My dealer hasn't got all of your goods in stock so please ship me the following:		
.....NO. 502 ELECTRIC PICKUP.	.....MIDGET SPEAKER	
.....NO.....ADAPTERS.	.....NO.....SOCKETS.	
<input type="checkbox"/> AMOUNT ENCLOSED. <input type="checkbox"/> SEND C. O. D.		
NAME.....		
STREET.....		
CITY.....		STATE.....

ALDEN MFG. COMPANY



ALWAYS A STEP AHEAD

NA-ALD has added to its line a new Electric Phonograph Pickup which fits AC or DC sets and electrically amplifies the music from records of any phonograph. Electrical reproduction of phonograph records is far superior to the usual mechanical reproduction and will bring out notes and detail never heard before. The surprisingly low cost of the NA-ALD pickup makes some people skeptical, but the NA-ALD pickup is sold on a money back guarantee. Buy one—take it home and attach it to your phonograph and radio set, use it for three days—and if you are not satisfied that it does everything we claim, return it and get your money refunded. You can use the NA-ALD Pickup on any phonograph—a portable will give just as good results as a big one.

ELECTRIC PICKUP



No. 502—Price \$5

Set builders—service men, set manufacturers, and manufacturers of eliminators, testing equipment and power packs will be delighted with the new NA-ALD sockets. NA-ALD sockets are made for all tubes—AC, Dry Cell, or DC types. There are more than twelve different types—all thoroughbreds. Special contacts on the outside of the tube prongs carry the heavy current to the AC tubes without voltage drop. The NA-ALD slogan—"It's the contact that counts" has been literally built into every NA-ALD socket and adapter. You can identify a NA-ALD socket or adapter anywhere by the copyrighted colored ring on top of each. This colored ring helps to guide the tube prongs into their correct holes and also to identify the right socket for the right tube. Once the tube is in the socket, "It's the contact that counts." NA-ALD contacts are then at work—they are always right—always clean—whether they are used with ordinary tubes—power tubes—AC tubes or rectifier tubes, you feel and are safe with NA-ALD sockets. Experience gained in building millions of sockets and adapters and multi-millions of contacts for them has made this possible. Special metals scientifically bent to give greatest



No. 481-XS—Price 65c



No. 304
New Price, only \$19.50



To improve tone quality several power amplifiers are now being made. The TRU-PHONIC power amplifier for battery sets will improve tone quality and give more volume. The fullness and richness of TRU-PHONIC tone quality cannot be realized until it is heard. Thousands of satisfied users back up this statement. Don't get rid of your old set—it costs only a few dollars to put a TRU-PHONIC Amplifier on it and make it equal or better the results of sets costing five or six times as much. The NA-ALD TRU-PHONIC Amplifier is also ideal for television amplifier and a Dynamic Cone speaker amplifier. Most sets selling under \$100 do not satisfactorily operate a Dynamic speaker, but with a TRU-PHONIC Amplifier will bring out the high and low notes with richness and fullness beyond expectation. Individual TRU-PHONIC couplers are also made for set builders and manufacturers.

strength are used in all NA-ALD sockets and adapters. There are NA-ALD sockets for mounting above or below metal or bakelite sub panels—on wooden baseboards—in up-side down positions—or on metal base panels. The NA-ALD Cushion Sockets for sub panel or baseboard mounting are unexcelled. The 481XS illustrated is recommended for sensitive detector tubes—dry cell tubes, and the new sensitive screen grid tubes. NA-ALD silencer sockets cushion the tube perfectly. Note their action, absorbing all shocks—sidewise, up and down, or pivotally. Leading manufacturers, such as Silver-Marshall, use them in kits and sets.

The NA-ALD line is too extensive to describe fully in this space—so why not write for complete details in the booklets listed below—they will help you get the most out of your radio.



No. 426—Price 50c

~ ~ ~ ~ Brockton, Mass.

ALDEN MANUFACTURING CO. Dept. CCB3
Brockton, Mass.

Please send me the Booklets marked below:

- CONVERTING BATTERY SETS TO A. C. SETS.
- HOW TO GET THE MOST OF YOUR RADIO.
- WHAT TO BUILD BOOKLET.
- THE SOCKET STORY.
- COMPLETE NA-ALD CATALOG.

NAME.....

STREET.....

CITY..... STATE.....

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Pierson Phono-Radio



ABOVE is illustrated, the GREATEST VALUE IN PHONO-RADIOS on the market. Think of it:—THE ORLEANS sells at List, with Magnetic Speaker, completely equipped for \$185.00, or with Dynamic at \$215.00. The equipment consists of A.C. Induction Type Electric Motor, Cobalt Magnet, Electric Pickup, Statuary Bronze Tone Arm, Two-Way H & H Phono-Radio Switch, Volume Control, Radio Adapter, etc.

THE ORLEANS will house such sets as Radiola 18, or 60—Graybar, Brunswick, Federal and in fact any set, with wonderful results.

Special—

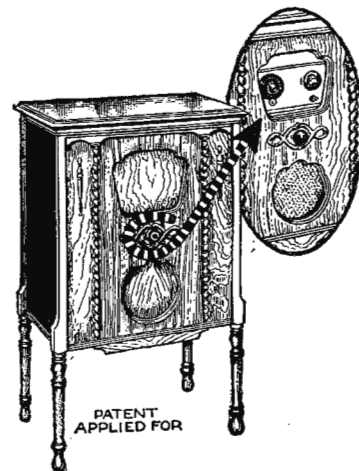
Atwater-Kent, Crosley, Steinite and sets having center Tuning Control, can use the **Miracle Phono-Radio**, listing at \$156.00 complete, with Dynamic Speaker.

“Be First with Pierson”

THE PIERSON COMPANY

ROCKFORD, ILL.

The “MIRACLE” Radio Cabinet



“When You See the Revolving Door You’ll Know— It’s the MIRACLE”

DEALERS

Advance information is now available on the MIRACLE CABINET. WRITE FOR IT TODAY!

Custom-Radio Builders, ATTENTION

PIERSON protects your profits. You have a complete line to select from and no mail order house can sell your customers.

Write today for application for Dealer’s Pass Card, which will admit you to any of our Wholesale Display Rooms.

THE PIERSON CO.

830 Cedar Street

Rockford

Illinois

Barawik - the Old Reliable

RADIO SERVICE

RADIO fans and readers, from "way back when," will remember the exceptional service that Barawik rendered when getting radio parts was like pulling hen's teeth. First upon the scene, Barawik was always ready to deliver the newest developments in radio to its customers in the days when changes were fast and furious.

Today Barawik has grown to be a mighty institution in the radio world. Here you can secure the proved, reliable merchandise of the world's leading radio manufacturers—everything from complete sets to the smallest individual parts so necessary to the set builder. You can depend upon the reliability of Barawik goods. You can depend upon Barawik's ability to deliver the kind of service that means time saved in waiting. You can depend upon Barawik's honesty, ability and willingness to serve you—and last, but far from least, you know that Barawik's big discounts assure you of the lowest prices always—prices that mean huge savings to you in everything you buy.

Amateur and Short Wave Equipment

BARAWIK is the pioneer in supplying kits and parts for short wave receivers and transmitters. We are headquarters for all the popular short wave circuits such as: Hammarlund, Aero, Karas, Cardwell, R.E.L., National, etc., as well as the individual parts used in the assembly of all makes of short wave receivers and transmitters.

Television

Television is still in its infancy and far from perfect, but we are keeping abreast of all events in this new field and will be able to supply fans with the various necessary parts to keep up experiments as new developments come out.

Radio Supplies

The BARAWIK CO. has, all these years, been famous for its variety of radio supplies, which it offers at money-saving prices. Newest dynamic speakers, "B" eliminators, socket power equipment, A-C harness, fine cabinets and furniture, amplifiers, latest short wave and ham equipment, tubes, television supplies, batteries; in fact, anything you can ask for is here, ready to ship, at a saving in price. Quality merchandise, selected goods by reliable makers—just what you want—at big discounts.

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For those fans who want to "build their own," from first-class, reliable parts, we have complete kits of parts for every known circuit. The famous kits of the world's leading radio circuit designers—everything in the good old reliable stand-by circuits, as well as the new pretentious ones that are the last word in radio perfection. Hundreds of thousands of fans have used our kits and saved thousands of dollars. Your savings now are greater than ever.

Radio Parts

The standard parts of all the famous radio manufacturers are for you to choose from. Your favorite part can be had from BARAWIK

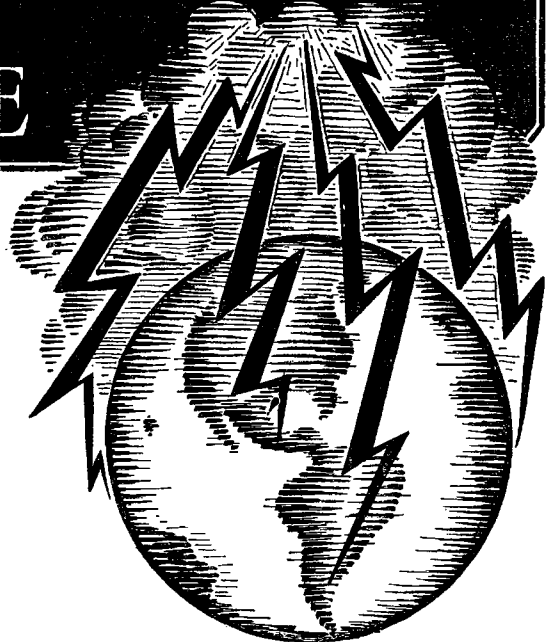
at a bargain. Coils, transformers, condensers—audios, tone filters, panels, rheostats, switches, grid leaks, binding posts, brackets, wiring material, jacks, sockets, dials—everything you can think of—the best, newest and most famous brands—at big savings.

Radio Sets

BARAWIK factory-built sets are exceptional values. The newest and latest models from which to choose: battery-operated, all-electric, A-C, etc., with 5, 6, 7, 8, 9 and 10 tubes, in cabinets, self-speakers, consoles, highboys and many beautiful designs. Marvelous values in portable sets—great bargains in standard sets for home use. A variety of styles for every purpose, every taste, every whim, and every pocketbook, always at money-saving discounts.

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Besides a complete radio line, Barawik gives you the opportunity to buy, at big savings, auto tires, parts and accessories, sporting goods, electrical and wiring material, electrical household appliances, golf equipment and many of the things that are necessities for every man and in every home. Don't pass up the chance to save money on the many every-day needs offered you by Barawik.



Your Savings Are Tremendous

Ask any of the quarter million Barawik customers why they trade here, and they'll tell you that, **quality considered**, our prices can't be beat. That's something to think about! Quality comes first—good, new, fresh, reliable merchandise, but the price always means a tremendous saving, nevertheless. Get our catalog and prove this to yourself. Don't spend a nickel until you see our offerings first.

Send Coupon Today—NOW

You need this book as you never needed it before; you need it before you spend another cent on radio. Just mail the coupon and this big, profusely illustrated Radio Catalog, Guide and Cyclopedia will be sent to you free. Be sure to write for this new big edition today.

BARAWIK CO., 311 Canal Sta., Chicago

Please send me the big free Barawik Radio Guide, Catalog and Radio Cyclopedia at once, showing the many new bargains you offer.

Your Name.....

Address.....

City.....State.....



The Barawik Co.

311 Canal Station

CHICAGO, ILL.

U. S. A.

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine and Scientific Digest

We want IMMEDIATELY

5000 Dealers

Thorola TUBE



The demand for Thorola Tubes compels us to get wider distribution *immediately*. We must add at least 5000 dealers quickly! To get them—and to make the Thorola line everywhere available to the Thorola buying public—we make this *amazing* offer to dealers who will *act at once*.

WE OFFER FREE

With Each \$100 (Net) Order of Thorola Tubes

THIS MARVELOUS TONED

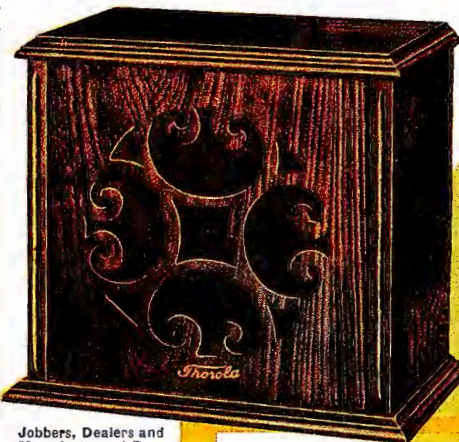
Thorola DYNAMIC SPEAKER

The finest type of dynamic speaker available today—made by Thorola, for ten years nationally famous in the loud speaker field. This offer has no strings attached to it. We make it to get *immediate* wider distribution of the world's finest *one-year guaranteed* tubes—and to assure adequate representation of the complete Thorola line of tubes and loud speakers.

Take advantage of this offer, Mr. Dealer! Of necessity, it is limited as to time. Thorola offers you a generous 50% off list tube prices. In addition, you get absolutely FREE this nationally famous Thorola Dynamic. We ask you only to demonstrate to your trade the wonderful new reproduction afforded by this magnificent toned speaker.

YOURS! This THOROLA DYNAMIC

This magnificent-toned Thorola Dynamic Speaker actually "breathes." Catches and reproduces with life-like realism every note from the highest violin treble to the lowest boom of the kettle drum. Ten inch cone, 25% larger than usual, gives greater volume and efficiency. Mounted in beautifully designed solid walnut cabinet, 15 inches wide, 13 3/4 inches high, 8 1/2 inches deep. Furnished for both 110 volt AC (with built-in rectifier) or 6 volt DC. Specify type you want sent with order.



Jobbers, Dealers and Manufacturers' Representatives are invited to write or wire us immediately for full particulars regarding a very desirable proposition.

THOROLA RADIO PRODUCTS
110 East 21st Street
Chicago, Illinois

Please ship at once my order for Thorola *Guaranteed* Tubes totaling \$..... (less 50% discount). Find my itemized order attached. If my order amounts to \$100 or more **NET**, I understand that I will receive absolutely FREE one Thorola Dynamic Speaker.

Name.....
Firm.....
Address.....

The Thorola line offers a *guaranteed* tube for every requirement; also matched sets of AC tubes.

50% off

LIST PRICES

All Standard Types

No sliding scale discounts —50% from current list price is your discount on any quantity.

DC TUBES

Type	List
204-A	\$1.50
V-199	2.25
X-199	2.25
X-11	2.50
X-12	2.50
X-120	2.50
X-222	6.50

AC TUBES

226	2.25
227	4.00
AC-171	4.00
280	4.25
222-AC	7.50

POWER TUBES

X-171	2.75
X-112	2.75
112-A	2.75
171-A	2.75
200-A	4.00
281	7.50
250	11.50
210	9.00

MATCHED SETS OF AC TUBES

No. 6 AC KIT

1-AC-227	List Price
1-AC-171	\$22.25
4-AC-226	
1-280 (Rectifier)	

No. 7 AC KIT

1-AC-227	List Price
1-AC-171	\$24.50
5-AC-226	
1-280 (Rectifier)	

No. 8 PUSH PULL KIT

1-AC-227	List Price
2-AC-171	\$26.25
4-AC-226	
1-280 (Rectifier)	

Thorola Tubes - the World's Finest Guaranteed Line

For ten years Thorola has stood for the best in the field of *fine* radio. This name on radio tubes is absolute assurance of rigid quality standards, long life and dependable performance. Every Thorola Tube is scientifically engineered, laboratory tested and backed by a gilt-edged, full year's unconditional guarantee which is made good directly at the factory if any tube proves defective.

DEALERS! Order your requirements from list opposite—50% off list prices. *Get your order in immediately!* Upon receipt of your \$100 (net) order for Thorola tubes, we will ship at once with your order a FREE demonstrator Solid Walnut Thorola Dynamic Speaker. Don't pass up this opportunity—the season's most sensational dealer offer! We can afford to make it only because we must have immediate representation everywhere. *Wire your order today.* Or fill in the coupon below and mail at once. *Act immediately,* before the supply of Thorola Dynamic Speakers set aside for this special purpose is exhausted.

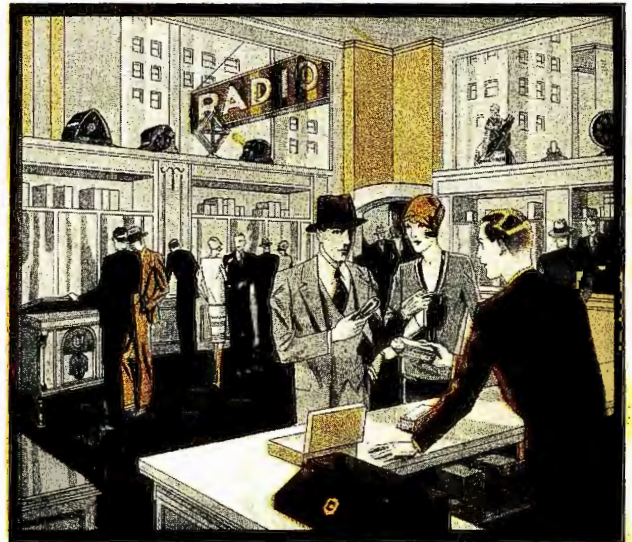
THOROLA RADIO PRODUCTS
General Offices: 110 East 21st St., Chicago

Thorola

Guaranteed TUBES "World's Finest Tube Line"

SONATRON

THE WORLD'S LARGEST RADIO TUBE LINE



Seeking
a better tube
Millions now buy *Sonatrons*

44 DISTINCT TYPES

The World's Largest Radio Tube Line contains a tube for every need in modern radio:

AC TUBES

X226, Y227, X222AC, X171AC, X401

POWER TUBES

X112, X112A, X171, X171A, X210, X250

GENERAL PURPOSE TUBES

X201A, X222, X200A, X201B, X240

RECTIFYING TUBES

SH85 X280, X281, X213, X216B

DRY CELL TUBES

199A, X199, V199, X120, V120, 120A

—and many others

THE search for a better radio tube has ended at the shelves of Sonatron's dealers. The insistent demand of America's growing radio family for superlative tube performance has brought Sonatron a popularity which has placed it high in its field.

Steadily, the conviction grows that radio tubes play a most important part in radio reception, and Sonatron sales rise in direct ratio to the spread of this conviction. Seeking a better tube, millions turn to Sonatron—and find in the Sonatron label a definite assurance of quality.

Today, Sonatron radio tubes are sold by thousands of dealers to millions of radio listeners. The qualities of finer tone, greater

volume and a far longer life which are built into Sonatron tubes have created a straightforward confidence in the Sonatron label as a symbol of tube satisfaction.

The prophecy of a better tube service observed in Sonatron's determination to fill every radio need, has been realized in a consistent quality which has interested millions. The World's Largest Radio Tube Line offers a tube for every socket—and offers with it a performance that knows no competition.

If you have not yet experienced the thrill of Sonatron quality in your radio reception, visit your Sonatron dealer today. *From then on, you will know a new satisfaction in radio.*

SONATRON TUBE COMPANY

16 Hudson Street, New York City

88 Eighth Avenue, Newark, N. J.

108 West Lake Street, Chicago

Cable Address: SONATRON-NEWARK

If you are buying a new radio, demand Sonatrons as initial equipment. If you already own a set, replace with Sonatrons—and note the difference!

SONATRON TUBE COMPANY, 108 W. Lake St., Chicago
Gentlemen: Please send me the FREE book, "How To Take Care of Your Radio Tubes"

Name

Street Address or R. F. D.

City and State

FREE!
To Set Owners
New 1929 Edition
of Sonatron's famous book: "How To Take Care of Your Radio Tubes"

